The Perception of Elderly Respondents to the Interior Features of Sheltered Housing

by

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Abstract

As most elderly people are believed to spend the majority of their time indoors, the physical interior environment is likely to be of particular importance to them. Research relating to the concerns of elderly people and their perceptions has been subject to significant growth in recent times. This study, then, is concerned with acquiring knowledge of elderly people's perceptions toward sheltered housing design. The principal aims are to examine and apply multi-methodologies to improve the effectiveness of data gathered from elderly respondents and to understand their perceptions of the interior environments they inhabit. Moreover, the purpose of the study is to determine the relative importance that the elderly attach to the various key interior elements and spatial areas within a sheltered housing scheme, in order to facilitate an improvement in these schemes as a whole.

Initially, this thesis provides an introduction briefly explaining the motivation and background of the study along with the research aims and objectives. The related academic literature is then presented along with an outline of the background of each method used. Following this, the main research is detailed describing the four different methods, namely: Visual Record survey, Sketch Map survey, Detailed Recall survey and User-centred Conversational Tour, which are subsequently integrated with the goal of achieving more accurate and reliable results.

Furthermore, the findings of the study established the priority of selected interior elements and spatial areas within the recent sheltered housing scheme, as assessed by elderly subjects. The design issues were summarised as the subjects' perceptions of sheltered housing arrangements and their spatial design preferences. Indeed, they provide a provisional check list for the future design of residential environments for the

elderly or modifications to existing facilities. In addition, the study provides a basic understanding of how elderly people observe unfamiliar spaces. More specifically, the results could be used to establish budget priorities relative to the building of new sheltered accommodation and should certainly be considered in the design or modification of residential environments for the elderly.

The research was carried out by De Montfort University and in association with Leicester City Council Housing Department (LCC Housing Department). It was an investigation into elderly persons' perceptions of the interior environments of sheltered housing, with the intention of improving contemporary sheltered housing design. The facts presented and views expressed in this thesis are, however, those of the author and not necessarily those of the LCC Housing department.

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CHAPTER 1.

INTRODUCTION

1.1 Motivation and background

1.1.1 Motivation

Research relating to the concerns of elderly people and their perceptions has been subject to significant growth in recent times. Initially then, it should be stressed that the selection of a particular methodology to be used in any specific piece of research is dependent upon and influenced by the topic being investigated and the population to be studied. Moreover, the researcher seeking to discover and learn the views of people in relation to environment is confronted with a choice of three main techniques: observation, questionnaires, and interviews. However, most of these methods involve direct contact with the subject to achieve their aims. More specifically, it could be argued that an individual's attitude toward the research topic might have a significant influence on his/her responses to any questions asked (Gillham 2000). For example, questionnaires or interviews may determine elderly people's perceptions about their living environment and provide an evaluation of current design. Nonetheless, there is a possibility that participants may be unwilling to provide truthful answers to the questions, especially if the questionnaire was conducted by an organisation directly connected to the participant (Bradburn, Sudman and associates 1980; Gillham 2000). This may be apparent because participants are afraid a poor reply could affect their current benefit and that they would, effectively, lose the trust of the organisation. Therefore, it could be argued that the closer an organisation is to the research subject the more likely it is that results will be significantly effected and unreliable. In addition, there is a possibility that elderly participants may be susceptible to providing a more favourable response to any research questions. They may, therefore, supply the researcher with answers they think they want to hear, while at the same time

suppressing their own true feelings and opinions.

Furthermore, most current research has revealed the importance of tenant participation in the design process (Hackney and Waddington 1988; Thornton 2000). Indeed, consultation and involvement can be viewed as key tools in maintaining and improving recent design, thereby making sure that it is the end user who is central to the planning and development of the design outcome. Moreover, other research highlights the fact that elderly people are different; physically, cognitively and socially (Stokes 1992). For example: ageing in general is concomitant with decreases in ability to respond and adapt. (Burnside 1986) and by possessing a greater understanding of the special needs of elderly people a more successful spatial design environment for them can be achieved. Thus, in order to make this possible, it is essential that elderly people be seen to be both contributors and consumers in the research process. Additionally, as elderly people experience a decline in sensory functioning, due to the ageing process or illness (Webb and Weber 2003; Collingsworth and Rehahn 1993), most appear to spend the vast majority of their time within their home environment (Kellaher 1986). Therefore, it can be surmised that the interior environment is likely to be of particular importance for elderly people. Also, it is apparent that most recent research studies stem mainly from a social science perspective and are focused on residential services, quality of care and policies etc. (Sumner 2002) or the quality of residential homes for old people (Riseborough and Jones 2005). In addition, some of the research into the design of interior environments, for the elderly, is principally focused on the special needs of residents and the contributions that promote their independence e.g. studies by Green (1975), Valines (1988) etc. Consequently, as an interior design researcher, the author decided to concentrate efforts on the sheltered housing environment by approaching this

study from an interior design perspective. The intention of this was to gain a better understanding of elderly peoples' perceptions towards an improvement of sheltered housing schemes.

In addition, the NHS Institute for Innovation and Improvement (2007a) argue that the main difficulty apparent in studying people's experience and perception in general is that, "as an inner subjective, immaterial phenomenon, it can never be accessed or observed directly, but only indirectly through other methods to recall their experience". As a result, one of the principal aims of this study is to consider the application of different indirect methods [1] together with a real site feedback (User-centred Conversational Tour[2]) in order to reveal information on how the elderly occupants interact with the interior spaces and elements therein. Most importantly, this exercise should be carried out without the participant being made aware of the aims of each method used in this study.

1.1.2 Background

The age profile of the world population has shifted upwards during the twentieth century. According to the United Nations Population Division (2007), up to 2050, the elderly population is expected to continue growing more rapidly than the population in any other age group. Indeed, these statistics reveal that in developed countries, over a fifth of the population is currently aged 60 years or over and by 2050 it is projected that nearly a third will be in that age group. Therefore, in order to adapt to the changes

[1] The direct method allows the participant to know the purpose of the approach, while the indirect method determines that the information is acquired without the participant being privy to the aims behind the research method.

[2] User-centred Conversational Tour (UCCT) involves the participants being taken to the place of research and encouraged to give an account of and express their feelings concerning this environment in context. More detail is presented in sections 3.4 & 4.7.2

associated with population ageing, it is imperative that the quality of physical environments provided for elderly people is satisfactory.

Furthermore, it is important to state that environments affect us, they affect what we think, feel and do (Day 2004; Leibrock 2000). The idea of supportive environments which promote health and well-being is widely accepted and on-going research continues to indicate that environments influence behaviour and shape ones actions. Accordingly, research by Lawton (1982), asserts that the lower the competence of the individual the more liable his or her behaviour becomes a reflection of the influence of environmental forces. In particular, for elderly people, the ageing process brings on the gradual degeneration of the body and nervous system and with these changes both the quantity and quality of sensory information available to them may be reduced. Ultimately, this may result in a diminished perceptual system and decline in awareness of environmental stimuli. Hence, a well-designed environment will have a positive effect for elderly tenants and enable them to be supported in realising their aspirations, whilst a poorly-designed home would only serve to frustrate them. Moreover, some research suggests that people in general spend most of their lives within a building environment (Evans and McCoy 1998). Clearly, this highlights the significance of the design of interior environments for elderly people, since they are likely to spend considerably more time in their own environment than other groups in the population.

In the UK there are specific standards and regulations related to housing design, which are mainly provided by government or local authority. Most of these are not directly applied as standards for housing for the older people but indirectly related to the design of the space for them, including the Health Facilities Note 19 (HFN19) from the Department of Health (Centre for Accessible Environments 1998). Similarly, The

Health Building Note series by The Stationary Office is intended to provide advice on the briefing on design of health building and part M of the Building Regulations (in Scotland Technical Standards Part T). Furthermore, regulations related to health and safety, fire safety, Disability Discrimination (Act. 1995) and other policies applied by individual local authorities, are used to specify the housing environment for elderly people to provide a well designed environment and improve well-being for elderly people. Detail on those related regulations are described in chapter 2.5.3. In addition, organisations such as Age Concern, Housing Care and Help the Aged etc. provide information and advice on how to choose the housing service that best suits the individual needs of elderly people.

1.2 Aims and objectives of the research

The principal aims of this research are:

- To examine and apply multi-methodologies to improve the effectiveness of data gathered from elderly respondents.
- To determine the priority of the selected spatial areas and design elements to the elderly.
- To acquire knowledge on elderly people's perceptions toward sheltered housing design.

Therefore to produce a design guideline to assist the improvement of recent sheltered housing scheme. In order to achieve these aims, the objectives are:

1. To review the relevant literature incorporating: specific methodologies used to determine elderly persons' perception of environment, environmental behaviour theories and the background of elderly people and their residential environments.

2. To discover how the elderly observe spaces and their priority in relation to the defined five individual spatial areas[3] within the sheltered house scheme by the use of a Visual Record survey[4].

3. To determine the order of priority related to five selected spatial areas and five interior design elements[5] by the use of Sketch Map[6] & Detail Recall survey[7].

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[3] The 5 selected spatial areas comprise: entrance area, common room, common kitchen, laundry, and common shower room. Detail of selected spatial areas are specified in section 1.5.1

[4] Visual Record survey (VRS): To explore how elderly people observe/inspect in unfamiliar spaces and reveal their awareness of these selected spatial areas by recording their visual perspective and verbal information throughout the duration of their visit. More detail is presented in sections 3.2 & 4.5.2

[5] There were 8 design elements selected for this study, including: size of the room, layout of space, colour scheme, decoration, lighting, furniture & equipment, spatial arrangement and flooring. However, in accordance with the limitations of the Detail Recall survey, there were only 5 design elements selected, which comprise: colour scheme, decoration, lighting, furniture & equipment and flooring. Details of selected interior elements are specified in section 1.5.1

4. Use of the Sketch Map and User-centred Conversational Tour to determine elderly peoples' perceptions towards sheltered housing schemes and establish which interior elements are relevant, in order to assist in effective improvements for this type of accommodation.

5. To evaluate the research methods and results via a questionnaire survey for the elderly subjects and compare these with other methods used in this research. Following this, interview interior design related professionals for their opinions and suggestions concerning the methods used.

6. To analyse the results from the methods used and form conclusions.

7. To identify any requirements for further research.

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[6] Sketch Map survey (SMS): The Sketch Map technique was utilised to test the subject's cognition of each of the selected spatial areas by producing a drawing, from their memory, of their own and visited scheme. In particular, this would include the space arrangement and elements within each selected spatial area. More detail is presented in sections 3.3.1 & 4.5.3.1 & 4.7.1

[7] Detail Recall survey (DRS): Detail Recall was employed to test the subjects' memory of detailed interior elements in their own scheme and the visited one to obtain more information on the elderly subjects' awareness of selected design elements within five selected spatial areas. More detail is presented in sections 3.3.2 & 4.6

1.3 Methodology

1.3.1 Documentary research

This study is a detailed account of the process involved in researching elderly people's awareness of interior spatial areas, elements and perceptions of spatial design, in a sheltered housing scheme. The general literature search was undertaken to explore the characteristics of elderly people, as well as the environmental influences they are subject to. In particular, the literature concerning past methodologies, that had previously been used to determine people's environmental perception, was reviewed and applied to this research.

1.3.2 Framework development

The aim of the study is to determine elderly peoples' awareness and perception of selected interior elements and interior spatial areas, within sheltered housing schemes. In order to accomplish this, four different techniques were effectively combined to allow for cross checking the gathered data and assist in the attainment of more accurate results. Firstly, the Visual Record method employed a new research device called the "Visual Witness Glasses". Instead of conducting observation from a third person's viewpoint this device enabled the recording of the visit directly from the subject's perspective. Secondly, a memory test technique with 2 different parts: Sketch Map and Detail Recall, was applied by using a drawing exercise and a questionnaire to test the subjects' recall of detailed interior elements and the spatial layout. By adopting this technique the intention was to reveal the elderly subjects' awareness of the selected spatial areas and interior design elements, particularly as visual memory is acknowledged as being selective and that people remember what is useful and important

to them (Cohen 1989).

Thirdly, in this study, a technique named “conversational tour” was adopted with the researcher asking participants to give feedback in real settings. This would effectively achieve a more direct response, thereby removing most of the bias that might occur via conventional techniques, such as questionnaires etc. (Lee et al. 2006). For this part of the research, then, the participants are not required to imagine or recall their memories of a space in order to provide feedback and, therefore, any unintentional influences are eliminated or at least substantially reduced. Potentially, a greater understanding and response to people’s experience and opinions, in the development of sheltered housing schemes, can be gained from this conversational approach.

In figure 1.1 (P.29), a framework is provided in order to illustrate the research structure and the relationship between chapters. A brief resume of the content of each Chapter follows:

- **Chapter 1** (introduction) will initially explain the motivation and the background of the study. The research aims and objectives will be set out in section 1.2. Section 1.3 includes an overview of the methodology and outline of the framework, along with the contents of each chapter. Then, section 1.4 presents specific related research works to this project. Furthermore, section 1.5 provides a brief definition of the terms and constraints of the project and the limitations encountered in the study. Section 1.6 will conclude with the research outcome.

- **Chapter 2** (Review of research area) will review the academic literature under five headings comprised of two main parts: background and interior. The chapter presents an overview of the relevant literature regarding the nature of the space and

the knowledge of the elderly participants.

- **Chapter 3** (Methodology) this chapter reviews the literature concerning past methodologies that had previously been used to determine people's environmental perception. Moreover, defines and justifies the options open to researchers in selecting a research methodology appropriate to this project including: Visual Record survey (VRS), Sketch Map survey (SMS), Detail Recall survey (DRS) technique and User-centred Conversational Tour (UCCT). This chapter will then detail the aims and objectives of each methodology used, along with the processes and methods involved in the collection and analysis of data.

- **Chapter 4** (Multi-method approach) sets out the research schedule and how interviewees were chosen. In particular, this chapter explains how the research aims, namely: awareness of spatial area, awareness of design elements and elderly peoples' perceptions of the sheltered housing scheme, were achieved by the selection of appropriate methodologies. Each section provides brief introduction of the research process and methods for the analysis of each methodology. A summary of all the findings from the different methodologies concludes this chapter.

- **Chapter 5** (Research evaluation) presents a detailed account of the research evaluation from the elderly subjects' questionnaire survey and the information collected from interviews with 9 professionals from an interior design or architecture background. Their opinions and suggestions regarding the study are summarised and discussed at the end of the chapter.

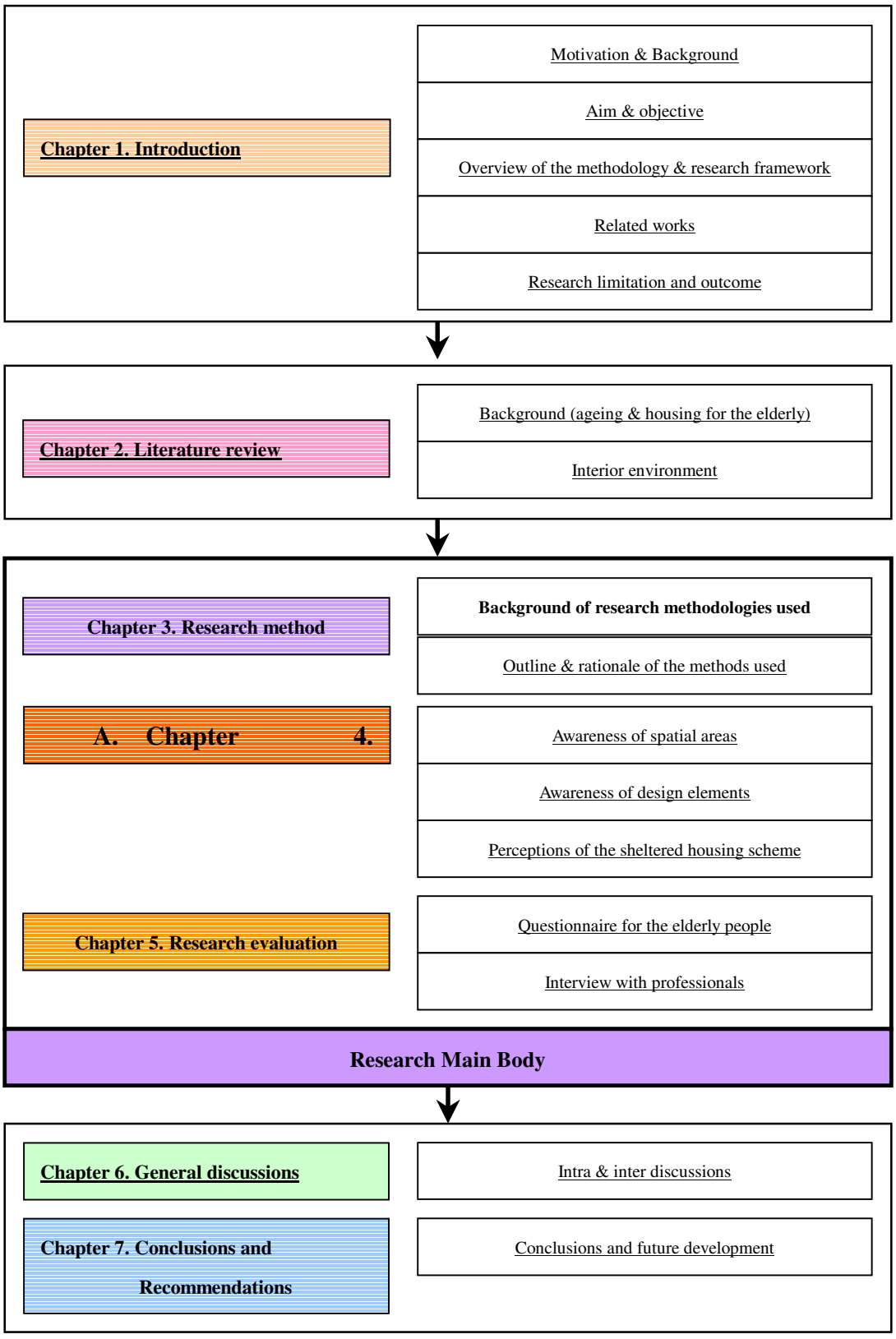

Figure 1.1 The framework of the research.

- **Chapter 6** (General discussion) presents an overall view of the study and is divided into intra discussion and inter discussion. The intra discussion provides a discussion on subject selection and the individual methodologies used to produce the various data. The inter discussion includes connections between the methods used and research findings between methodologies.

- Finally **chapter 7** (conclusions and recommendations) will explain the conclusions and recommendations for possible future development.

1.4 Related works

As the ageing population is growing rapidly, there has been increased public concern about the quality of physical environments provided for elderly people in both local authority and independent sectors. However, much of the related research derives mainly from a social science perspective and is focused on residential services, policies or the quality of residential homes for old people etc. (e.g. studies by Parry and Tompson 1995; Brech and Potter 1994). Nevertheless, some of the research into the design of interior environments, for the elderly, is principally focused on the physical needs of residents e.g. studies by Green (1975), Valines (1988) etc. Indeed, many of these studies are specifically relevant to the development of residential accommodation for the elderly. In particular, these studies have emphasised the application of interior ergonomics to meet the special needs of elderly occupants. Moreover, these present a systematic process for the planning, programming and design of environments, for the elderly, that contribute to them retaining their independence. Furthermore, there is an increasing amount of research that attempts to apply theory from the field of environmental psychology to the design of interior space. (Miller and Schlitt 1985; Parker et al. 2004). Much of the focus of these studies is centred upon the architectural elements and their relation to residents' domains e.g. privacy, identity and cognitive requirements etc. More specifically, they are more concerned with covering such requirements as: out door space, material, building form and circulation spaces etc. Nonetheless, as most elderly people spend the majority of their time indoors, the interior environment is more likely to be of particular importance to them. Therefore, in order to redress this imbalance, the overall aims of this study were mainly focused on the relationship between the elderly people and their interior environment. Furthermore,

studies of environmental influences have been numerous over the past decade (Netten 1993; Leibrock 2000). Crucially, most of these suggest that supportive environments contribute to the promotion of health and well-being.

In addition, most previous research has employed more traditional methodological approaches e.g. structured interviews or questionnaires to find out people's perception of spatial design. However, as some previous studies suggest, the impact of a design environment is frequently subliminal (Holahan 1978). Consequently, those methods may have directly influenced the consistency and definitiveness of the findings and may have lead to gaps in the data. As a result, most recently, some new or modified methodologies have been developed by social scientists and adopted by researchers in the spatial design field to elicit more detail on a subject's actual thinking about a space. Indeed, technological approaches such as the use of photography, film and video have been more prevalent recently to support the gathered data. In particular, some researchers asked subjects to take still pictures of their environment to be combined with accounts of their emotional feeling and perception of the space (Rich et al. 2000; Radley et al. 2003).

Moreover, to reduce the bias that might occur via conventional techniques in spatial research, whereby participants normally need to imagine or recall their memories about the space to give feedback. Millar (2006) utilised the "Conversational Tour", in which participants are taken to the actual place of research and encouraged to explain themselves and express their feelings about this environment in context.

Furthermore, it is apparent that many approaches for detecting a person's behavioural responses to their environment and their viewing strategies employ observation as the main method. However, it is very difficult, as an external observer, to

determine which elements the subjects pay attention to, whilst investigating an unfamiliar environment, as there is no external sign that a person is or is not paying attention (Norman 1976). Additionally, ID Magasin (2005) and Guardian news and media limited (2005) used "Eye Contact"[8] as a marketing research tool to explore customers' viewing strategies by recording their visual responses and behaviour during a shopping journey. Primarily, this was used to determine which displayed advertisements have the most impact on consumers.

Moreover, there appears to be growing research interest in environmental perceptions and cognition (Wood and Beck 1989; Spencer and Dixon 1983) which investigate the understanding of cognitive maps that individuals hold of the environments they occupy. Sketch Map technique, for instance, has been frequently used as a primary method for collecting sources of information on an individual's environmental knowledge. The same methodology has also been employed for the study of way finding (Passini 1984; Rovine and Weisman 1989). More recently, Millar (2006) asked her participants to produce a drawing of an interior spatial area from their memory to reveal both their perceptions of the individual space and how the design of the space is represented to them. However, it should be pointed out that most of these studies were mainly focused on large scale environments rather than a building's interior space. Therefore, the difficulty in employing this method, for analysis of the gathered information, is that it is very subjective and relies on one single method to predict people's perception of the spatial area. Ultimately, this may contribute to an unreliable outcome. Furthermore, there has been a lack of empirical research in the field

[8] Eye-contact is an audio-visual recording device with a camera contained in a pair of spectacles along with a means of recording attached to a belt. It is worn by a research participant and used to record their field of view throughout the research period.

of elderly people's perceptions of environment, particularly in relation to interior design.

For these reasons, in this study a multi-method approach was considered to be the most suitable methodology. By combining the Visual Record, Memory Recall and User-centred Conversational Tour, it was hoped that this multi-method approach would enable the various data to be cross checked and, therefore, produce a more accurate and reliable result. The descriptions of the rationale and the background literature behind each of the methodologies used are discussed in chapter 3.

1.5 Research limitation and constraint

1.5.1 Definition

To effectively classify the research constraints, the terms and definitions of the research are described below.

(1) Awareness

The Longman dictionary of contemporary English (1995) defines “awareness” as “Knowledge or understanding of a particular subject or situation”. In order to relate this closely to the terms of this research, the author defines awareness, essentially, as the individual’s knowledge of the environment, particularly the selected spatial areas and design elements they have paid attention to.

(2) Perception

According to the Longman dictionary of contemporary English (1995) the definition of “Perception” is “the way that you notice things with your senses”. Stokes (1992) defines perception as the process by which a person organizes and makes sense of incoming stimuli. In another way, perception can be said to be the process by which data from the environment is interpreted to allow us to make sense of it (Malim 1994).

As this study is principally aimed at understanding people and their living environment, the definition of perception here, will therefore be closely related to how people feel and think about their living environment. In this case the living environment refers to the sheltered housing schemes.

(3) Elderly people

Definition of the old or elderly is complex and can be greatly influenced by individual, national and cultural differences. The United Nations (UN) define people

aged 65 and over as elderly people. They can be divided into at least three stages, the young-old (65 to about 75), the old-old (75 to 85), and the very old (those aged over 85) (Suzman and Riley 1985). Although, in accordance with the protocol of the sheltered housing scheme (Leicester City Council Sheltered Housing Department 2005) it is intended to specifically identify persons at least 60 years or over and, therefore, for the purposes of this study, this protocol will be adhered to.

In addition, the intention of this research was to provide a measure of the subjective experience of elderly residents. Therefore, in order to gather results which could be validated and maintain reliability, it was important that those individuals selected were without mental disorder and able to manage their daily life with some degree of independence. Given this specific criteria, as a basis for the selection of research subjects, it was concluded that the most suitable persons to meet these requirements were those who lived in council built sheltered housing schemes.

(4) Interior spaces

There were five interior spatial areas selected according to the functional space of the standard sheltered housing schemes including: Entrance area, common room lounge, common kitchen, laundry, common shower room, all of which are considered to be the major communal areas of the building. Other areas present include: corridor, staircase area, storage area, warden's office, library and guest room etc. Nonetheless, as some of those areas are considered to be merely transitional spaces or are not included at all in some schemes, it was concluded that they were of less relevance to this study and that they did not have much significance in the subject's daily lives. Thus, in order to promote more consistent data, these particular spaces were excluded from the study.

(5) Interior design elements

The main factors influencing the form of interior spaces are usually defined by the architectural elements of structure. These structural elements effectively compose the form of a building, define each individual area and generate a complex pattern of interior spaces. For the purposes of this study the term "interior environment" is intended to refer only to those aspects of the visual elements within a range of typical sheltered housing setting in the UK. Moreover, according to Ching (1987), interior design content can be subdivided into nine elements, which are: Floors, walls, ceilings, windows, doors, stairs, furniture, lighting and accessories (decoration). Therefore, this protocol was utilised to select the main elements used for this research. Furthermore, in order to determine a more coherent structure for the study, the author merged five of the interior elements from Ching's list, including: walls, ceilings, windows, doors and stairs, into one category called "Layout of space". In particular, this included the positioning of those elements and their visual sensory affect on the individual participants. Moreover, other research (Miller and Schlitt 1985; Sadalla and Oxley 1985) demonstrates that colour, dimension of space and spatial arrangement correspond closely to the satisfaction of the personal need of home. As a result, eight particular design elements, with the strongest influence on the interior space, were selected as the main focus of this research, including: size of the room[9], layout of space[10], colour scheme[11], decoration[12], lighting[13], furniture & equipment[14], spatial arrangement (furniture arrangement)[15] and

[9] Size of the room: Size/dimension of individual area
[10] Layout of space: Shape of space, Position of door, Position of window, Location of individual space/area, Location of stairs, Level of floor
[11] Colour scheme: Colour scheme (painting) of individual space
[12] Decoration: Decoration of individual space/area, e.g wallpaper
[13] Lighting: Lighting system of individual space
[14] Furniture and equipment: Including all fixed and moveable furniture

flooring[16].

It is also important, in the context of this investigation, that the intention is to refer only to those aspects of the visual elements within a range of typical sheltered housing environments and to study their impact upon the aged.

1.5.2 Limitation of research

Due to the nature of this study, involving elderly people as participants, there are inherent difficulties presented by ethical and privacy issues, making it problematic in locating willing and suitable subjects to participate. Moreover, the complexities of carrying out this research i.e. the considerable time involved in the application of four different methodologies, would significantly restrict the numbers of subjects able to participate.

In order to achieve an effective representation of a broader group of people, who live in council owned sheltered housing, the subjects for this study were randomly selected from fifteen different sheltered housing schemes. However, as the sample was relatively small in size, it could be argued that the findings can only be seen as representative of the elderly people in typical sheltered housing. Additionally, it was concluded that issues related to personal attitudes and background would not suit the purpose of this study and, therefore, were excluded. General discussions of the research problems and difficulties raised will be explored in more detail in Chapter 6.

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[15] Spatial arrangement: Furniture/equipment arrangement in individual space/area
[16] Flooring: Floor material, colour & texture etc.

1.6 Research outcome

The major benefits to be obtained from good housing design are that they have potential to reduce the care and health expenditure and assist in a considerable improvement in elderly peoples' quality of life (Bridge 2007). In order to effectively achieve these improvements, accurate data of elderly peoples' needs and requirements is essential. Therefore, this research is aimed at exploring a multi-methodological approach to determining elderly peoples' awareness of the design of sheltered housing and their perceptions toward it. Particularly, within research involving elderly people, these methodologies can be repeated and adapted for use in other studies. While this research is primarily aimed at interior designers, architects and sheltered housing providers, it will also be of interest to other professionals such as voluntary organizations representing older people, policy makers and anyone else with an interest in good practice in the design of sheltered housing environments.

Moreover, the financial constraints that local authorities inevitably have had to deal with, particularly as the switch from investment in new housing to improving existing public stock is currently the reality, make it essential that budgets must be used as effectively as possible. Potentially, the benefit of acquiring a good understanding of the needs of older people is that costs can effectively be minimised.

Therefore, the results of this research are important in two respects. Firstly, that they provide information on which spatial areas and design elements elderly people pay particular attention to, and their responses and perception to the interior design generally. The results of the research can then be utilised to establish budget priorities relative to the existing schemes and assist in effective financial planning and, ultimately, provide

more satisfactory environments. Secondly, and possibly more importantly, the methodologies used could be repeated and adapted for use in other studies relating to people's perception of interior spaces.

CHAPTER 2.

REVIEW OF RESEARCH AREA

2.1 Introduction

The answers to providing satisfactory living environments for the elderly do not rely upon any single discipline. Therefore, in order to understand elderly people's needs and improve their living environments, this requires the knowledge from many disciplines working together to arrive at the best possible solution. In this study, the focus is, essentially, on three research areas which incorporate: elderly people, interior design and research methodology. In particular, there is an emphasis on these methodologies regarding the gathering of people's perception of space. Thus, this chapter presents an exploration of these three disciplines via a number of related literature searches.

The overall literature framework comprises three main parts (Figure 2.1), namely: background, interior environment and research methodology. Therefore, with the framework established, the sections of this chapter are set out as follow. Section 2.2 presents a variety of relevant background literature on the ageing process and elderly people. In this section, it is important to demonstrate a coherent understanding of the principle of the participants and provide evidence to support the motivations of the

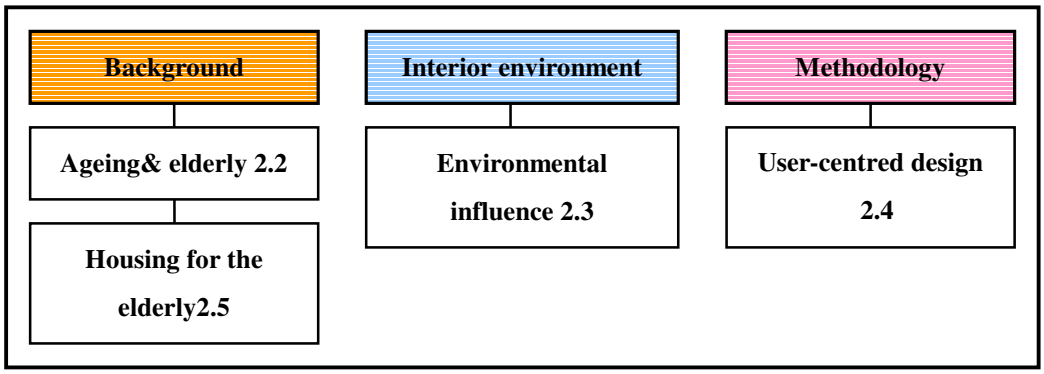


Figure. 2.1 Framework of chapter 2.

research, such as the significant increase in the ageing population. Section 2.3 is essentially a discussion on the influence of environment and the possible meanings related to the selected design elements. Section 2.4 is a presentation of literature concerned with user-centred design, highlighting the increasing importance of closely involving the end user in the design process and development. Section, 2.5 provides a brief introduction of the recent housing options for elderly people in the UK along with building standards and regulations.

2.2 Ageing and elderly people

2.2.1 Introduction

Historically, a small proportion of the human population reached old age and very few would reach advanced years. However, improvements in diet, healthcare and other environmental factors have significantly increased life expectancy for all people. In fact, according to the "2007 Revision", a report from United Nations Population Division indicates that the world population will likely increase from the current 6.7 billion to 9.2 billion in 2050. More importantly, the slow population growth and increasing longevity is leading to an ageing population. In the more developed regions, 20 per cent of the population is already aged 60 years or over and by 2050 that proportion is projected to grow to almost 2 billion (32 per cent) (Figure 2.2; United Nations Population Division 2007). Between 2005 and 2050, half of the increase in the world population will be accounted for by a rise in the population aged 60 years or over and the number of older persons in developed countries is expected to be more than double the number of children.

Furthermore, the projection for the United Kingdom between the years 2006-2050 is that there will be a significant increase in people over 60 from 12.8 to 19.7million. By

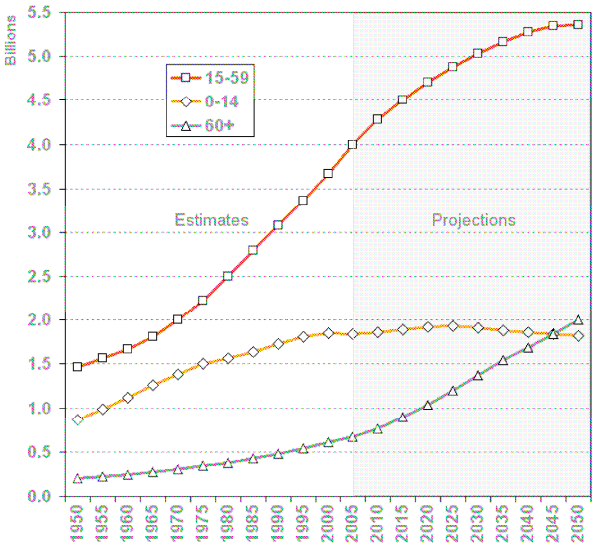


Figure 2.2: World population by age groups, 1950-2050(United Nations Population Division 2007)

2050 it is projected that 29% of the population will be over 60 (United Nations Population Division 2007). Population ageing will continue during the first half of this century. This large increase reflects improving survival rates and the fact that after the Second World War through to the mid 1960s a baby boom generation emerged. However, the baby boom generation faces a very different prospect as it turns into a "gerontic boom" with its move into retirement, probably between the years 2010 and 2030 (National statistics 2007). Additionally, due to higher survival rates and a lower propensity to remarry, older women are more likely than older men to live alone. Indeed, worldwide there are an estimated 19 per cent of women aged 60 years or over living alone, whereas only 8 per cent of men in that age group do so (United Nations Population Division 2007).

As a result, the growing proportion of old people in the population will raise many important issues relating to their living environment. By highlighting the need for understanding what elderly people actually think has also resulted in considerable research.

2.2.2 Concept of old age

Ageing is far more complex than might appear at first sight and presents the researcher with some difficulty in providing a satisfactory definition. It can be approached from a number of different perspectives. While the sociologist tends to focus on social roles and the relationship the aged have with society, the psychologist's approach is more centered on thoughts of individual adaptability and adjustment. Chronological age is most commonly used as the criterion for a concept of old age

(Stokes 1992). However, there is no single reliable measure of ageing. Most gerontologists usually take an age of 60 or 65 years as indicating the beginning of "old age". (Hamilton 2006).

There is no doubt that at this age, a significant decline in many of the physical and psychological processes first become apparent. Burnside (1986) states that a fundamental and pervasive change that occurs with age is a slowing of thought and behaviour. He maintains that the general sensory changes in old age are:

- A general decline in awareness of environmental stimuli.
- Concomitant decreases in ability to respond and adapt.
- Some sensory deficits after age 75 in three out of five persons.
- Sensory deprivation and sensory overload possible.

Overall, the body systems begin to show a notable decline in function in the early stages of adulthood (late teens to early 20s). Whilst it is true to say that none shut down completely, there are apparent defects to be found at the cellular level which accumulate and, ultimately, lead to diminished viability (Stokes 1992). In addition, Stokes claims that ageing can be distinguished along three dimensions: physical age, psychological age and social age. Moreover, research by Suzman and Riley (1985) sets out particular stages of ageing taking into consideration general health condition. They, essentially divide people over 65 years of age into three separate groups. Firstly, they highlight the group termed the "young-old" (generally those individuals between the ages of 65 and 75), whose behaviour and characteristics are in many ways similar to those in middle age, i.e. that they remain fairly active. Secondly, is the "old-old" (aged between 75 and

85). This group demonstrates an increased propensity to incidences of physical frailty. However, many of these individuals are still living independently with access to both personal and environmental support. Finally, the “very old” (those aged over 85) who generally require more intensive support systems, often provided by various institutions, due to their greater mentally or impairment.

However, there are inherent difficulties presented when accepting these simple age distinctions. It could be argued that elderly people cannot be readily standardised, they are different in their desires, lifestyles and expectations, and have unique personalities and life histories (Stokes 1992). Furthermore, they may also be said to have a universal need to regard themselves as valid members of the community and to be active in society instead of just being the passive receivers of social care. More specifically, we need to think of elderly people in terms of inclusion, engagement and well-being, rather than illness, frailty and dependency (Improvement and development agency 2006).

2.2.3 Physical ageing

The process of ageing can be accepted as an inevitability of human existence. Significant and unavoidable changes in the function and structure of human bodily systems can be seen as central to the process of physical ageing. However, this process varies greatly from person to person according to the condition of their health and, therefore, most of these changes do not necessarily result in serious limitations (Stokes 1992). Nevertheless, we should acknowledge some of the common age related changes which include: a decline in human senses; the permanent wrinkling of the skin and loss of body hair especially in men; or the bone structure becoming extremely brittle; etc.

(Burnside 1986).

The physical ageing processes explored in this section are, in the main, either common in old age i.e. the general sensory changes or the more significant elements that accompany the individual with advancing years i.e. medical conditions. Hence, this section will be divided into two subsections, which are: “human senses and ageing” and “ageing and disease”.

2.2.3.1 Human senses and ageing

Human sensory stimulation is concerned with the different elements of sight, smell, hearing and touch. It is these senses that are employed as the brain’s most immediate means of contact with the surrounding environment and, accordingly, any apparent decline in their function directly impinges on the performance of the work (Hamilton 2006). Therefore, a more attentive appreciation of these senses, in relation to the elderly person’s living environment, is required, taking into consideration the decline in the structure and function of bodily systems. The following section will explore some significant factors on human senses and how these are conditioned by the effects of ageing.

(1) Vision

Georgia Tech's College of Computing (2006) explains the sense of vision as “the highly complex activity and yet it is accepted as the primary source of information we receive concerning the outside world”. In simple terms, the process involved in visual perception can be divided into two key stages. Firstly, there is the physical reception of

the stimulus from the outside world by the function of the eye itself. Secondly, the information that is gathered by the eye will be filtered and channelled to the brain, which in turn generates coherent images.

Moreover, Burnside (1986) and Stokes (1992) explain that age related changes to the visual sense could lessen the process by which the eye adjusts and is able to focus, producing a sharp image at various, changing distances from the object seen and decrease the ability to accommodate, thereby increasing the time needed for the recognition of visual information. Therefore, it appears to be more the case that these changes are the direct result of slower information processing activity rather than just the product of deterioration in the sensory system. Furthermore, a relatively common problem is that older people are less able to move their eyeball as far up as younger adults. In order for these particular elderly people to view objects above their line of view they are required to compensate by raising their heads, an action that can be readily achieved by young adults who are able to see with eye movements alone. Although most of the above problems can be serious and of annoyance to older people, they may not necessarily be regarded as crippling conditions.

(2) Hearing

It is a series of vibrations or sound waves that are the essential components of a hearing system. The human ear is particularly receptive to these vibrations and, through a complex process, transmits them to the auditory nerves (Georgia Tech's College of Computing 2006). While the sense of hearing has been largely considered as secondary to sight, the auditory system, nevertheless, possesses a tremendous capacity for the

conveyance of information.

Bromley (1988) asserts that throughout the course of adulthood there is a gradual decline in the individual's hearing and even for some adults as young as 50 there are at least some circumstances where this is impaired, for instance, with their ability to listen to even the faintest of sounds. Further, hearing loss is also commonly caused by the dysfunction of the hearing apparatus with increasing age. Indeed, Hamilton (2006) confirms that "higher frequency acuity and the ability to detect where a sound is coming from is impaired and affected by ageing because the bones of the middle ear including the hammer, anvil and stirrup bone tend to stiffen with age, through calcification or arthritis which affects the transmission of sound". Therefore, in order to process the auditory input, more time is required. More specifically, these conditions contribute to the individual becoming depressed.

(3) Other senses

The senses of taste, smell and touch are similar to vision and hearing, in that they inevitably deteriorate (Marsh 1980). However, Hamilton (2006) states that a decline in these other senses generally do not impose as directly on psychological functioning.

Smell

The sense of the smell is generally defined as the individuals ability to perceive odours. Some research has discovered that the effective decline in the sense of smell may be caused by the loss of brain cells in the olfactory bulb of the brain (Georgia Tech's College of Computing 2006). While the effectiveness of this sense appears to slow, it is relatively little changed by the ageing process (Corso 1981).

Taste

The sense of taste, perceived by humans, can be said to be comprised of four distinct types. These include: bitter taste, sour taste, salty taste and sweet taste. However, researchers in this field are of differing opinion when deciding on the degree to which a deterioration of sensitivity to these four elements is caused by the ageing process (Hamilton 2006). Moreover, Stevens et al. (1995) confirms that even presented with a significant decline in taste by ageing, there are substantial differences experienced between individuals.

Touch

It is important to stress that the sense of touch provides a major source of feedback in relation to human feeling. There are, however, apparent differences from that of sight and hearing, in that the apparatus of the sense of touch are not localised. The human skin incorporates three different types of sensory receptors and each of these receptors has a specific function. Thermo receptors respond to temperature, nociceptors respond to instances of intense pressure, heat and pain, and mechanoreceptors function is to respond to pressure (Georgia Tech's College 2006). In addition, Burnside (1986) highlights the fact that a reduction in perception of vibration, temperature and pressure brought about by the decline in sensitivity in the ageing process, has direct implications for the individual's response and reaction times and has a significant impact on how they can effectively adapt to their immediate environment.

2.2.3.2 Ageing and disease

It is evident that protection against viral infections is significantly affected by the impaired functioning of the immune system brought about by the ageing process. Stokes 1992) maintains that in comparison to young adults, elderly people not only suffer more frequently from a variety of illnesses, "but the diseases and disorders are often experienced simultaneously rather than sequentially". The likelihood for admission to hospital, as a result of these conditions, is increased threefold after patients are first seen in the accident and emergency department (Care and repair 2007). The most common physical illnesses encountered in old age are Parkinson's disease, Alzheimer's disease, and stroke, all of which are described below.

Parkinson's disease

The most common degenerative neurological condition, in older people, is Parkinson's disease, which effectively results in a significant impairment of mobility. Stokes (1992) confirms that individuals with this condition demonstrate a noticeable decline in cognitive function. He also describes the major characteristics of the disease as: poor and slow physical movements; propensity for the body to shake; and the possibility of a gait disorder. Moreover, an integral part of the disease is the individual's susceptibility to depression due to the reality of dealing with the considerable physical changes and the adjustment to what is clearly a debilitating illness.

Alzheimer's disease

Alzheimer's disease is a progressive condition concerning the loss of memory and

is the cause of dementia in both the middle aged and the elderly. The initial stages of the disease are commonly characterised by a decline in the ability to retain recently acquired information and the evident deterioration of an episodic memory (Hodges 2000). This would then, inevitably, develop into a condition of severe memory failure. Furthermore, there are additional symptoms that some patients may exhibit regarding the loss of mixed abilities including: intellectual skills, memory skills, and linguistic skills (Caine et al. 1994). Indeed, some people with the condition may be unable to perform complex skilled movements and also, may have visual difficulties in recognising objects and other elements within an environment. At a later stage, the gradual loss of linguistic skills may be apparent. Considerable problems may be experienced by the individual in their ability to produce the appropriate words in any given situation. Also the comprehension of abstract phrases may be severely tested at this stage of the disease (Burns 1995).

Stroke

Kermis (1983) states that "in addition to normal senescent decline, cardiovascular illness typically has a harmful effect on brain function". Perhaps the most significant instance of this is the stroke. Strokes occur when there is an interruption of the blood supply to a section of the brain, thereby causing death of the affected brain tissues.

The most common incidences of Strokes occur in elderly adults after 55 years of age. More specifically, with each additional decade these incidences are effectively doubled (Hamilton 2006). It is important to acknowledge that, for people in later life, strokes remain one of the major causes of death, disability and dependence. In a

significant 50 per cent of patients, the main symptoms are considerable failures in speech and language function.

2.2.4 Psychological ageing

The phenomenon of psychological ageing is complex and unique. There are profound effects on psychological functioning and significant psychological consequences as a result of changes in the physical state of the brain and body (Stokes 1992). Therefore, what follows below is a discussion concerning the effects of ageing on intelligence and cognition.

2.2.4.1 Intelligence and age

The correlation of intelligence to increased age is a complex notion. Nonetheless, findings from earlier cross-sectional studies have presented more straightforward conclusions. Wechsler's research (1972) concludes that through advancing years the efficiency of the brain is significantly reduced, thereby, impacting on the individual's intellectual abilities. However, the more prevalent assumption has been that compared to our physical abilities, the function of our mental abilities remain relatively unimpaired until much later in life or until the onset of serious illness and a deterioration of the sensory functions become apparent in later life (Wechsler 1972).

Another valid explanation of the decline in intelligence that occurs with increased age is that it can be effectively viewed as being the slowing of thought and behaviour. Regardless of the fact that a slowing of behavioural function may reduce the efficiency of the mechanics of intelligence, individuals are likely to hold their own when it comes to the application of experience or what is commonly called 'wisdom' (Stokes 1992,

Salthouse 1982). In conclusion, it could be said that it is inevitable that all individuals in later life experience a marked decline in their intellectual functioning (Stokes 1992). Indeed, any age related decline that does occur may not be dramatic enough to impact on the elderly person's adaptive ability.

2.2.4.2 Cognition

Neisser (1967) explains that "cognitive refers to all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used." Cognition is initiated by a sensory input and the transformation of physical energy received from the physical world outside our bodies. This information is then changed into a pattern of neural events in our neural and cognitive systems, where it will be further processed. This information will then be translated into specific varieties of awareness, perception, intelligence, intuition, personal acquaintance, recognition, skill and understanding etc. (Best 1999).

For some individuals a slowdown in cognitive function is clearly a phenomenon related to age. There is a general assumption that there is an inevitable decline in the complex chain of cognitive processes experienced by older individuals (Neisser 1967). The sensory changes influencing the quantity and quality of sensory information available to elderly people directly affect the slowing input (perceptual) process and output (motor) processes (Salthouse 1982). While the implications of this is effectively a decline in performance later in life, the implementation of supportive environments could readily compensate for the individual's abilities which may have substantially been reduced. In addition, research here demonstrates that elderly people's "experience

and previous learning can help to reduce the effects of cognitive decline" (Stokes 1992).

Moreover, Best (1999) acknowledges the importance of attention and memory within the cognitive process. He asserts that "people create a representation of the environment by paying attention to the incoming information in order to classify it, and use memory to store it". Therefore what follows below is an exploration of these two aspects of attention and memory.

(1) Attention

Malim (1994) states that as a general definition, attention refers to the "concentration and focusing of mental effort". In order for information to be acquired from external stimuli a cognitive process is set in motion. However, mental effect is not only discriminating and able to shift, but also it can be divided into parts (Best 1999). Selectivity is central to the phenomenon of attention. Therefore selective attention acts as the individual's filter to deal with incoming stimuli and to determine whether or not they are relevant (Stork 1992). This is, primarily, because the system responsible for processing information is unable to respond simultaneously to all the sensory stimuli that it is exposed to.

Best (1999) states that "when we focus mental effort on a task, the action seems to be under our conscious control". More specifically, this means that we make conscious decisions about which stimuli we afford more attention and which ones will be rejected. Nonetheless, selective decisions are carried out not only consciously but also unconsciously. Indeed, individuals are not necessarily always aware of every element in their environment of which they could be potentially aware. It can be argued that there

is a substantial amount of cognitive function that may be deemed as unconscious (James 1983).

Furthermore, some evidence suggests that elderly people can be more easily distracted and find it more difficult to discount the clutter of irrelevant data. Nevertheless, it seems evident that the difference between the elderly and young adults is at the point when, "the tasks are demanding in terms of speed, sustained effect and memory" (Stokes 1992). Moreover, Kausler (1982) concludes that as the number of stimuli processed increases elderly people process information at a much slower rate.

(2) Human Memory

It can be stated that one of the most consistent human needs is that of effective memory ability. Central to this memory ability is the importance of intellectual performance, problem solving and information processing. Stokes (1992) argues that "without the ability to remember, our concept of self would be tenuous in the extreme". In most research concerning the function of memory ability, there are, invariably three forms of storages established: sensory memory storage, short-term memory storage and long-term memory storage. All these types of storage are able to process forms of representations termed "cognitive codes and transferred from storage to storage by control processes" (Best 1999). Firstly, then, sensory storage is a large-capacity storage retaining sensory stimulation in raw form without any apparent coding. Secondly, long-term storage is responsible for our permanently held memories and is considered more durable. Finally, information within long-term storage is semantically organized and is affected by the interference of other stored memories (Best 1999). Further

literature concerning these three storage processes is outlined below.

- **Sensory memory**

The main characteristics of Sensory memory are, firstly, that it is a very brief short-term memory store. And, secondly, the information that it contains is derived from stimuli detected by the each sensory channel at a sensory pre-perceptual stage of organization" (Stokes 1992; Georgia Tech's College of Computing 2006). The important fact to note here is that data is passed from sensory memory into short-term memory store by means of attention. The information is then filtered out, thereby retaining only those important elements. Indeed, the information is stored for a fraction of a second in the sensory storage, effectively buffering the received stimuli through the senses resulting in the loss of cognitive codes whose disappearance is produced strictly by passing time. In order to transfer the cognitive code from the sensory storage, an individual must allocate particular resources to extract the information before it fades or is lost altogether. In comparing the age difference in sensory memory, Stokes (1992) maintains there is insufficient evidence to suggest age related changes in the process of sensory memory system.

- **Short-term memory**

The cognitive codes are transferred from sensory storage to short term storage components. There are, however, limitations to Short-term memory as opposed to the sensory storage. Its function is that it "acts as a scratchpad for temporary recall of the information under process" (Stokes 1992). Furthermore, the data that is stored in

Short-term memory is transformed into “a cognitive code that is acoustic, verbal or linguistic” (Birren and Schaie 2001). Moreover, the information in Short-term memory resides for a much longer period of time than with the sensory storage. Nevertheless, its capacity is significantly limited through deterioration by interference, which accounts for a requirement to complete the tasks held in short-term memory as soon as possible (Georgia Tech's College of Computing 2006).

- **Long-term memory**

The potential capacity of long-term storage is quite considerable. Its main function is information storage over a considerable period of time. There are, effectively three main stages in the process of long-term memory storage, which include: storage, deletion and retrieval. Long-term memory receives information from short-term memory which is then stored by what is known as ‘rehearsal’. This is the process that allows coded material to be transferred between these two storages. Rehearsal, then, refers to the function responsible for maintaining the vitality of the coded material in short-term storage. It is important, therefore, that the application of rehearsal periodically refreshes the short term code so that data can be effectively stored for much longer periods. The main causes of the deletion of memory are the presence of interference, decay and sometimes emotion is directly responsible for its loss. In order to recover this lost information, there are two different types of information retrieval process namely: Recall and recognition. In the recall process, the data is reproduced from memory. In the recognition process the information acknowledges that the data has been seen or experienced previously

There are two distinct forms of long-term memory: episodic memory and semantic memory. Stokes (1992) explains that data or information is selected for additional processing after the initial detection by sensory memory and will "move into episodic memory via the intermediate stage of semantic memory". Firstly, then, the function of episodic memory is to assist in reconstructing the memory of life events at any given point. In other words it is the representation of our memory of events and experiences in a serial form. Moreover, this information is able to be preserved either by significant repetition or it is transferred into storage permanently. "Once in permanent store information is, in theory, never lost" (Stokes 1992). Secondly, semantic memory is essentially a record that is more structured, which embodies the "logical, factual information, concepts and skills that we have acquired". It is explained that the data stored in semantic memory is taken from the information in our own individual episodic memory. More specifically, it is there to an extent that we are able to learn new facts or concepts from our experiences (Best 1999; Georgia Tech's College of Computing 2006).

- **Memory and ageing**

It is true to say that forgetfulness is a major complaint of elderly people. Indeed, there are some studies which highlight the varying nature of factors involved such as: an individual's emotional state, physical changes in the body and the individual's socioeconomic background, all of which can have a profound effect on the function of ageing memory (Hamilton 2006). However, as the elements concerned with the storage and retrieval of information are numerous and varied, it presents particular difficulties to identify whether there is an overall deterioration in memory operations or whether there are specific aspects of memory processes that are more sensitive while others are

immune to the effects of ageing (Schaie and Willis 2001). Therefore, it becomes extremely difficult to disregard the influences of ageing when conducting studies involving human memory as a methodology.

In addition, there are some other influences on memory that should be considered. For example: West et al. (2002) discovered that an individual's memory performance can be greatly affected by the particular time of day that they carry out memory ability tests. The findings of West's research demonstrate that older adults are generally more alert in the morning, while younger adults were, however, alert in the evening. Hence, it appears that memory testing, conducted at various times of the day, can accentuate age differences and so would need to be taken into consideration when elderly people are the subjects of a research project.

2.2.5 Conclusion

The literature review related to ageing and its effects on elderly people has revealed the fact that the ageing process can be identified with the changes in the structure and function of human physical systems. Accordingly, the information process fed to the brain, from the surrounding environment, is less effective; it could be less detailed given the general slowing of the nervous system which takes longer to arrive (Burnside 1986 and Stokes 1992).

Furthermore, those changes can also have profound effects upon psychological functioning and, therefore, could affect the individual's ability to adapt to their surroundings. As the focus of this study was on environmental spatial design for elderly people, a discussion of the main effects of ageing on awareness of environment and mobility are presented below.

(1) Awareness of environmental stimuli

Salthouse (1982) explains that there are substantial age differences in the sensory processes concerning the detection and discrimination of environmental information. Indeed, there is evidence to suggest that elderly people can be more easily distracted and, therefore, unable to disregard a significant amount of irrelevant information. Studies by Farkas and Hoyer (1980) reveal that age differences first become apparent when older individuals are required to locate the relevant stimulus by scanning irrelevant stimuli. The results, therefore, show that elderly people take much longer than younger adults in the completion of tasks. Kausler (1982) suggests that this may be due to a slower rate of information processing in elderly people as the number of stimuli

processed increase.

The ageing process may be said to affect a reduction in sensory input which may cause difficulties for older people in coping with their domestic environment. This is particularly relevant to weaknesses in vision and hearing (Marsh 1980). Nevertheless, the inevitability of the sensory changes which accompany advancing age, in most people, means that there will be a reduction in both the quantity and quality of sensory data available to elderly people. Rabbitt (1988) states that "this can bring about a diminished perceptual system and also that any peripheral sensory losses can cause problems with their cognitive ability and project quite unjust images of their true capabilities".

The loss of visual functioning related to increased age is subject to a number of specific conditions which include, firstly, a decline in visual acuity. Secondly, there is a decline in the individual's ability to adapt to the dark and to function in low light levels. Thirdly, there is increased difficulty in judging distances and focusing on objects at varying distances and, finally, a decline in colour discrimination (Branch 1989). Generally, the changes of age-related vision are experienced by middle aged individuals and progress gradually through increased age.

Moreover, Stokes (1992) maintains that it is usually the case that elderly individuals are "less sensitive to changes in the strength of visual stimuli". The effectiveness of the visual spectrum increases with progressive ageing and because of an increase in the opacity of the lens the individual's tolerance to glare declines. Furthermore, the individual becomes significantly slower adapting to the dark. Therefore it is apparent that elderly people, when moving from well-lit conditions into a

semi-darkened environment, take a longer period of time to adapt to variance in the levels of lighting they experience (Stokes 1992). The implication for significant visual decline in old age is that it may present unfavourable emotional and behavioural consequences. Moreover, it is argued that this may contribute to perceptual alterations such as shrinkage of the person's spatial environment (Cavanaugh and Fields 2006).

In effect hearing loss, generally, shows the same progression with age as difficulties with vision (Schaie and Willis 2002). However, because the function of hearing is central to the realm of social communication, a decline in the amount that an individual can hear with clarity and comprehension frequently generates a feeling of increased social isolation. Furthermore, a loss of hearing may have a significant impact causing a variety of adverse emotional reactions, such as loss of independence, irritation, paranoia, and depression (Fozard 1990, Cavanaugh and Fields 2006). Moreover, Rabbitt (1988) explains that increasing hearing loss makes extended conversations more effortful and much less rewarding. In addition, a decline in the individual's awareness of environmental stimuli and effectiveness of their perceptual system are experienced by the elderly person with increased hearing loss.

(2) Changes in Mobility

An important aspect of independence for an individual is their ability to function by moving around. Moreover, with increasing age there are some changes that we experience that impact on our mobility (Cavanaugh and Fields 2006). There is a significant amount of bone tissue loss and a decrease in the amount of muscle associated with increased age. In addition, Currey et al. (1996) explains that the

age-related changes observed in striated muscle are similar in nature to those identified following long-term muscle inactivity. This study, also reports that the onset of bone loss is experienced by individuals in their late 30s, accelerates in the 50s, and slows by the 70s. In some cases the onset of osteoporosis may be apparent with the bones effectively becoming more brittle. Elderly people may be subject to an increased tendency to fall when ligaments and joints progressively become stiffer and their muscles weaken bringing about changes in balance and dizziness and vertigo disease. This may affect the ability of the elderly person to stoop and grip. In addition, the elderly person's ability to reach is significantly affected by their limited limb extension and diminishing height. These changes may limit the elderly person's ability to move around and operate effectively in their immediate environment. More specifically, their independence is diminished and their ability to carry out everyday routines (Cavanaugh and Fields 2006).

Additionally, elderly people's social life may be affected by a decline in health related to their physical and psychological limitations (Johnson 1978; Rabbitt 1988; Stokes 1992). Moreover, it can be seen that in comparison to individuals from other age groups elderly people have very different expectations of housing and environment. This is essentially due to them having to contend with a change in capacity and a significant reduction in their abilities. In order to compensate for this decline in abilities, the provision of supportive environments is essential in addressing the special concerns of the elderly. Overall, only by acknowledging the conditions of the ageing process are we able to improve living environments for elderly people and determine a quality of life for all people throughout the whole lifespan.

2.3 Interior environment influence

2.3.1 Introduction

The influence of designed environments has been extensively reported. It demonstrates that "environment affects us; it affects what we think, feel, and do" (Miller and Schlitt 1985, Day 2004). Accordingly, it is widely accepted that supportive environments contribute to the promotion of health and well-being. In addition, Leibrock (2000) contributes to on-going research indicating that "environments impact on our behaviour and influence ones actions, and emotions and produce feelings of fear, peace, solitude, excitement and numerous others". Similarly, the productive committee of the Whole Building Design Guide (WBDG 2004) has also argued that, a residents functioning and general well-being is greatly affected by interior environments. An environment related to preference may effectively enhance positive emotion and be more likely to make provision for support and resources that acknowledge survival and well-being. However, negative affective states can "serve as warnings of potential harm or discomforts" (Heerwagen 2004; Millar 2004).

Additionally, research by Lawton (1982), explains that the influence of environmental forces may be reflected in the behaviour of the individual, particularly those with lower competence in general. Therefore, as the ageing process often causes the body and nervous system to gradually degenerate, it is important to state that a well-designed environment will have a significant effect and help support elderly people in realising their aspirations, whilst a poorly-designed home can frustrate them. The language of space and its influence are described below.

2.3.2 Language of space

Lawson (2001) maintains that "Space is the essential stuff of a very fundamental and universal form of communication. Architecture organizes and structures space for us, and its interiors and the objects enclosing and inhabiting its rooms can facilitate or inhibit our activities by the way they use this language and we all make use of it throughout all of our lives as we move about in space and relate ourselves to others." Millar (2006) takes Trompenaars and Hampden-Turner's (1997) description of the "language" and uses it to describe the importance of "language of space." She states that "the spatial arrangement of the building relating to non-verbal communication accounts for 75 % of our total communication and the built semiotics used, relating to verbal communication, accounts for the other 25 %".

It can be seen that organization of space is an essential and effective tool used to directly or indirectly communicate with a building 'user'. Moreover, the spatial environment has the potential to communicate with other individuals and also encourage specific responses or behaviour (Lawton 1982; Lawson 2001). Therefore, architects are attempting to provide the building user with a positive environment by manipulating and adapting their designs. Factors related to the selected design elements in this study, from the perspective of previous research, is explored below.

(1) Dimension of the space (Size)

Each specific area of every building has its own particular size. The choices involved in deciding on the dimensions of each space are derived from the arrangement of individual areas in some specific order when those options are available. As with

spatial form the dimension of interior space is not only directly related to the nature of a building's structural system, but also determines a room's proportion and scale and influences how it is used (Ching 1987). Moreover, this can be said to significantly affect the occupant's views and feelings about these specific spaces. For instance, the respondents felt more "loftiness" or "grandeur" and more pleased and interested in "high ceilings" or "wider" buildings. Conversely, low ceilings often generate feelings of coziness, intimacy and more security (Nasar 1981; Ching 1987). Additionally, research by Sadalla and Oxley (1985), states that large sized rooms will create feelings of expansiveness and freedom, while small sized rooms could lead to feelings of confinement and crowding. Other research also argues that the size and shape of rooms can significantly affect the experience of the "atmosphere" of the individual space (Pennartz 1986).

(2) Layout of space

The structural form of a building initially forms the interior spatial and further uses wall and ceiling planes to isolate a portion of the space which is effectively related to surrounding spaces by the presence of windows and doorways (Ching 1987). Therefore, the combination of all these elements defines the layout of interior space.

The size and shape of a room, which is mostly formed by the situation of walls, can provide perceptual cues for us to separate them into a series of smaller spaces and providing the resident with "visual and acoustical privacy" (Miller and Schlitt's 1985; Ching 1987). However, those walls may also be said to act as barriers limiting our movement. In addition, the actual shape of a room can elicit differing reactions from people. For instance, the experience of an individual in a rectangular room is that it

appears to be larger and less crowded. Also, the presence of curved walls “are dynamic and visually active, leading our eyes along their curvature” (Ching 1987). Nevertheless, Evans and McCoy (1998) suggest that the shape of an interior space has a direct impact on the individual’s stimulation levels of space. More specifically, it is argued that too much variation in the space shape may be responsible for making the experience of the interior confusing, thereby contributing to the residents experiencing unduly high levels of stress. In addition, an important consideration for environmental design is that the layout of a space can directly influence the resident’s interpersonal relationships and is, therefore, conducive to socialization (Lawton, 1982). Evans (1998) proposed that space with a varied layout may significantly affect the resident’s social interaction. For example, an inter-connected layout frequently acknowledges sociability whereas a linear arrangement is more conducive to the promoting and controlling of privacy.

Furthermore, windows are responsible for drawing light and air into the interior spaces of buildings. Ching (1987) states that the windows size, shape and position “affect the visual integrity of wall surface and the sense of enclosure it provides”. Therefore it can be seen that a good placement of windows can greatly improve the resident’s quality of life and, moreover, heighten the morale of their carers and, ultimately, improve the quality of their care (Manser 1989). According to Miller and Schlitt’s (1985) study “windows provide an avenue of visual escape for those who are unable to move around” so that they can experience the solitude they may require. Furthermore, because windows are an established link between the interior and exterior they present an effective source of stimulation. The effects of this are, that they can directly experience change, variety, and new information such as the time, the weather, and other social and environmental activities. Moreover, in order for people to carry out

repetitive and routine tasks a more stimulating environment is required. Without this our overall level of arousal would be significantly low and we would be susceptible to boredom and distraction. In addition, regarding the position and size of windows which utilize natural light for indoor spaces, there are both positive and negative issues to be addressed. The negative issues incorporate glare and overheating, while positive issues include using it as a source of heating, or enhancing the occupants visual and emotional well-being. Manser (1989) maintains that in order to contribute to an improvement in the individual resident's quality of life, a well designed, well-proportioned building with generous windows and high levels of daylight is essential.

Furthermore, the location and layout of stairways are also significant elements of spatial transitions between spaces. The basic function of the staircase is that it connects the various levels of a building directing our movement around the interior space. The presence of wide, shallow steps may contribute to a more inviting feeling for the user, whereas narrow, steep stairways are generally utilized for more private environments (Ching 1987). In addition, Dalley (2002) maintains that an inclusive design of building layout should acknowledge the following elements: approach and access, moving through the interior, movement between levels, easy toileting and bathing and effective control of the environment.

(3) Colour

Mahnke et. al. (1987) believe that the presence of colour in and around our environment can stimulate "definite emotional and aesthetic associations and it influences us both psychologically and physiologically". However, preferences of colour can be highly personal as they are based on conditions such as the individual's

previous experience and cultural identity.

Studies of the psychology of colour in relation to emotion and behavior have been carried out for more than a century and suggest that colours can have a strong influence on our moods and emotions (Linton 1999). For example, some research dealing with the relationship between colour and mood suggests that individuals associate cool colours with a feeling of security (Miller and Schlitt 1985). Indeed, the colours of blue and green are generally regarded as being soothing and calm, whereas red, orange and yellow are accepted as more dynamic and stimulating colours which create more vitality. Therefore each colour can be said to influence us in a different way (Day, 2004). Similarly, other previous research indicates that cool colours can make a space peaceful and increase feelings of spaciousness, particularly in relation to room size. Conversely, warm colours contribute to an area being less spacious, while increasing stimulation (Lang 1993). In addition, a cross-cultural study by Kuller et. al. (2006) indicates that a more positive mood can be achieved with the effective use of good colour design.

(4) Lighting

Lighting is the one of the key elements for interior space. Without any light source there would be no visible form, colour or texture. In addition there would be no visible enclosure of interior space. Ching (1987) states that the general function of lighting design is to illuminate the space of an interior environment and assist the user in the performance of tasks and other activities with "appropriate speed, accuracy and comfort".

According to Miller and Schlitt's (1985) studies, the increases in brightness, produced by colour, sunlight, or auxiliary light sources are associated with greater

perceived spaciousness. Indeed, peoples' feelings of security are effectively enhanced by the introduction of both natural and artificial light in the design process. Research has shown that being warm in the physical sense correlates with being protected. Moreover, Sorensen and Brunnstrom (1995) suggests that the visual and emotional well-being of occupants is greatly enhanced by the appropriate use of natural light and, also, that it can effectively be used as a heating source.

Moreover, recent research by Kuller et. al (2006) indicates that in a work place environment, the employees' mood reached its highest point when the lighting was experienced at a medium level of brightness. However, there was a significant decline in mood when this became too bright. The individuals' mood was at its lowest point when the lighting was experienced as being much too dark.

Furthermore, Sorensen and Brunnstron (1995) carried out a three-year experimental study concerning improved lighting for a reading area in relation to the quality of life of older people. The results acquired from follow-up interviews with the participants demonstrate that they were reluctant to return to the previous poor lighting conditions.

(5) Decoration

Ching (1987) states that accessories in interior design can be defined as those items which present "a space with aesthetic enrichment and embellishment". Furthermore, he maintains that the situating of decorative accessories can "provide visual delight for the eye, textural interest for the hand or stimulation for the mind". In other words, the individual's senses are enhanced by the inclusion of items such as artwork, collections,

plants etc. Moreover, the style of decoration can be referred to as a reflection of the personality of those individuals who inhabit a place (Ching 1987).

Results from Markson and Cumming's (1974) study suggest that, elderly people have a strong sense of what is proper in the domestic setting. In particular, they are aware of which spatial configurations are appropriate for them personally and culturally. Additionally, some research has shown that a home-like décor would encourage more general communication (Gifford 1988). Indeed, possessions from the resident's previous home environment may contribute to residents creating a homely atmosphere. Miller and Schlitt's (1985) study suggests that people surrounded themselves with objects from their personal past, such as personal photographs or items of furniture, in order to create a feeling of permanence and security, thereby enabling the individual to experience a more comfortable environment.

(6) Furniture

Furniture may be said to be mediation between space and individuals (Ching 1987). It functions as a transition between an individual and the interior space in relation to form and scale. More specifically, it provides "comfort and utility in the tasks and activities we undertake which can either offer or limit physical comfort" (Ching 1987). Furthermore, our bodies can acquire direct feedback to inform us on whether the piece of furniture is suitable for its proposed use or not.

Additionally, Ching (1987) suggests that the visual character of interior settings play a major role in establishing the expressive qualities of a room. Moreover, this is influenced by each piece of furniture displaying specific styles of form, line, colour,

texture and scale. In addition, furniture can be seen as sculptural objects in space and is usually incorporated into a group relating to its function, which will be used for the organisation and structure of the space (Ching 1987). Moreover, Miller and Schlitt (1985), propose that utilising the furniture to create an enclosed space may contribute to people feeling a greater sense of protection and safety.

(7) Space arrangement

The main factor involved in the space arrangement of the individual interior space is the placement of furniture. Sommer, (1969) maintains that the way in which a space is used and perceived is directly influenced by the arrangement of a space. This can potentially contribute to greater individual social interaction.

Furthermore, affective placement of furniture with moveable components may afford more comfortable interpersonal distances, ease of eye contact and, also, during conversation and other interaction, establish a more physically comfortable environment. Moreover, this would encourage more interaction between the residents. Conversely, poor furniture arrangement, specifically those in a fixed position would be more inflexible and may make eye contact difficult. Therefore, interpersonal distances that are inappropriately close or far will effectively discourage social interaction (Evans and McCoy 1998).

(8) Flooring

The general functions of flooring are its ability to encompass all our interior activities, carry loads safely and, further, that the surfaces must be durable enough to withstand the rigors of continual use and wear for the proposed activity. Moreover, it

can be viewed as a constituent of interior furnishings. Currently, there is very little research literature related to the impact and influence of flooring. Indeed, most studies are more concerned with the colour and texture of the materials employed for the flooring. For instance, Ching (1987) explains that, the colour, pattern and texture of a surface act as a visual backdrop for an interior space. More importantly, they play a significant role in determining the character of these spaces. In addition, he states that light coloured flooring is effective in enhancing the level of light within an interior space, but a dark coloured floor is able to absorb most of the light falling on its surface and contribute to making the space feeling much smaller.

2.3.3 Conclusion

On-going research of interior elements and their influence on the elderly occupant indicate that our surroundings directly influence people's behaviour and shapes their actions and emotions and produces feelings of fear, peace, solitude, excitement and numerous others (Miller and Schlitt 1985, Day 2004). There is a widely acknowledged notion that concepts of supportive environments promoting health and well-being are socially beneficial (Heerwagen 2004). It clearly demonstrates that effective solutions and recommendations to the design of interior environments, for elderly people, are vital, particularly when faced with the decline in their physical ability (Stokes 1992; Burnside 1986).

Moreover, the literature review related to the effects of interior design shows that each design element has the potential to affect the well being of the individual. Indeed, it suggests that, in future research, each interior element should be studied as part of a

more complex system in order to create more effective healthcare building environments.

2.4 User centred design

2.4.1 Introduction

Black (2006) defines User-centred design as "engaging actively with end-users to gather insights that drive design from the earliest stages of product and service development, right through the design process." It is important, therefore, that user centered design involves people in the decision making process related to their individual needs and attempts to make the final design more effective and efficient by relating it more closely to the users' requirements.

Furthermore, it should be adopted to promote the individual's participation in the planning and development of all areas of provision. Also, with this aspect of design there is the case for providing roles for these individuals such as participating in research projects. Within all of these areas the participant can be said to be central to the function and structure of the design.

Berkun (2004) maintains that "good design" has to incorporate three specific areas: engineering (safety), performance (functionality) and the aesthetics of experience (usability) (Figure 2.3; P.77). For the purposes of this study: engineering is defined in terms of how safe and reliable it is regarding building regulations and standards; performance in terms of how well the designed environment carries out the job or is fit for purpose; and designing human experiences, relates to how the individual's interaction with the spatial design "feel" and whether this provides a "good experience". Sheltered housing building design has always been connected with the first two aspects of good design (safety and functionality). Nevertheless, a balance needs to be restored

Performance	+	Engineering	+	The aesthetics of experience
How well it does the job or is fit for purpose		How safe, well engineered and reliable it is		How the whole interaction with the product or service "feels" or is experienced
(Functionality)		(Safety)		(Usability)

Figure 2.3. The components of good design (Berkum 2004)

to acknowledge the third aspect (usability) as this is frequently a challenge for interior designers and architects.

Bate and Robert (2006) state that, in studying "experience", it is important to involve users at the centre of the decision making process as they have a very special kind of first-hand knowledge. Therefore, the task of studying people's experience is to gain access to that knowledge and use it in the service of a better design and a better experience for the user.

It is clear that there are now more studies and research involving the user throughout the whole process. This is especially true in relation to the health service, environment and policy decisions. Examples from the U.S. include ongoing work led by the Institute for Family-Centred Care. The Institute's work is focused, primarily, on family-centered approaches to pediatric care. Their goals are to "engage patients and families as advisors and leaders and collaborative health care professionals" (Institute for Family-Centred Care 2008). Likewise, in the UK, to 'intensify the search' for better

and more effective approaches and achieve a truly 'patient-led NHS' the NHS Institute for Innovation and Improvement (2007) introduced an improvement tool called Experience Based Design (EBD) in order to develop fresh ways of operating, better products and more satisfactory environments. This process is user focused design and concentrates directly on acquiring and understanding the user's experiences. In addition, the adoption of patient involvement has a positive impact on health improvement and patient experience, ultimately leading to an improvement in the quality of care and the development of more responsive and effective services. Moreover, The Consumer Focus Collaboration (2001) confirms that a more accessible and effective health service can be achieved with consumer participation in the decision-making of individual care and, consequently, this would lead to improvements in health outcomes.

Nevertheless, this involvement not only applies to health design, but has also been adopted by some local authorities. They have involved elderly citizens in the establishment of local priorities, developing and delivering services, and evaluating processes. For instance, since 2006 elderly London residents have been consulted and involved in developing the council's policies and deliverance of service.

2.4.2 Involving older people

In 1998, the UK government set up the 'Better Government for Older People Programme'. This was, essentially, to involve elderly citizens in promoting more effective coordination and the responsiveness of public service. They believe that engaging with older people to find out their experience of the services they receive is essential, as it can ensure the development of appropriate services. In order to maintain

and improve the quality of services currently provided it is important that the consultation and involvement of elderly people is embraced. Moreover, older people's views must not be ignored when looking at new ways of developing and delivering services.

Any project that involves older people as the end user, should acknowledge that it is important for them to be seen as contributors as well as consumers. Therefore, a principal means for the empowerment of older people should be to listen and respond to their needs (Carter and Beresford 2000). Indeed, this needs to be reflected in the use of a suitable methodological approach. However, there is limited research knowledge concerning elderly people's perceptions and preferences and yet this information could have a significant affect on their environment and the services that they receive. Most recent research reveals very little on which methods older people prefer for different purposes. Many conventional methods of acquiring elderly people's views can be said to be dull and unrewarding for those who take part. This may have been apparent in a survey by Patmore et al. (1999) concerned with how elderly people prefer to present their opinions on the health service. The results show that written self-completion questionnaires were widely disliked, partly because they excluded people with reading or writing difficulties. Other difficulties identified with the use of a "questionnaire" were that they were seen as impersonal, an extremely lengthy process and that they provided ready-supplied answers. However, Patmore et al. (1999) explains that group discussion is a more favourable method with people aged 65-79 than those aged 80 and over. Though, he states that the group members may not be able to effectively express their views and, therefore, could present an unrepresentative view of their actual opinions, whereas the individual interview may demonstrate a different view point.

Indeed, there are other popular ways of acquiring the opinions of older people in their own homes such as telephone discussion groups. Similarly, 'Three-way calling' is an effective way of linking elderly people by telephone. The most preferred method, however, was conducting the interview at home, because this would reach a wider range of people with health, mobility or other physical disabilities. The adoption of these methods would, effectively, allow older people to take control themselves (Seargeant, J. and Steele 1998). Nevertheless, in relation to interview, the elderly prefer to have advance notice of the questions and a suitable space to deliver their own considered message (Patmore et al. 1999).

2.4.3 Conclusion

In conclusion, a body of theoretical literature has indicated that the design of interior environments which take into consideration the views and needs of those who are to use them is likely to be effective in targeting those needs (Hartwell 1998). More specifically, this information indicates that involving elderly people as participants at all levels of the design and development of their own living environment is extremely beneficial. Thus, the study followed this principal to include elderly people across the research and, therefore, delivers an appreciation of their views. Indeed, it should be stated that the development of effective methods of involving elderly people in the decision making process is essential.

2.5 Housing for the elderly

2.5.1 Introduction

In general, as people grow older they do not necessarily wish to lose their independence; most want to maintain a home of their own for as long as possible (Tinker 1999). While many older people still live independently in the house that they had previously regarded as the family home, it must be recognised that much of this housing is either inappropriate or inadequate for the individual's current needs (Stokes 1992). It is often the case that they tend only to live in part of the house, leaving the rest to be largely neglected. For these individuals it becomes apparent that their living space is much bigger than they actually need. Thus, the design of space arrangement is no longer compatible with their remaining physical abilities. For example, when the toilet and bedroom are located upstairs, the staircase may become a barrier for them. Similarly, steep steps to the garden or the street can result in frailty, thereby making them become prisoners in their own homes (Tinker 1999).

Moreover, research has shown that during the past 40 years, there has been an almost worldwide decline in the proportion of co-residence between generations (Sundstrom 1994). Some older people are now moving into retirement housing because they fear that they will become dependent on their children and some feel they need a more supportive environment as they become physically frail with age. Furthermore, some individuals simply decide that they would like to live in a community of people their own age. This age similarity facilitates social interaction and the development of new friendship (silverstein and zablotsky 1996). Hence, a range of specially designed housing schemes for elderly people, to overcome their frailty and enhance their quality

of life and well being, are provided by local authorities, housing associations and the private sector. An outline of the background of recent housing options available in the UK, for elderly people, as well as the regulations and standards relating to those special buildings, are introduced in the following section.

2.5.2 Housing options for the elderly in UK

In Great Britain, around 90% of older people at age of 65 years live in ordinary housing, whether classed as owner-occupiers or as tenants in the public or private sector. The remaining 10% reside in sheltered housing of some type and this group amounts to 350,000, of whom approximately 35,000 live in local authority residential homes, 163,000 in independent residential homes, and 150,400 in nursing homes (Care and Repair England 2007).

The rights of individuals to choose their care home accommodation are contained in the National Assistance Act 1948 (Choice of accommodation) directions 1992 (Department of Health 2003). This provides guidance on what individuals should be able to expect from the council and enables them to exercise reasonable choice over the service that they receive.

The Ministry of Housing and Local Government and the Welsh Office (1969) identified specific categories of the major types of elderly accommodation. Category 1 accommodation is, essentially, specially designed housing built for occupation by older people and, invariably, is without alarms and other communal facilities. This category of accommodation most commonly consists of groups of flats or bungalows and without warden support. However, there is some housing within this category that have wardens

and alarm systems but, crucially, there are no communal facilities provided. The category 2 accommodation is sheltered housing schemes. These are mostly comprised of groups of flats, with the provision of private individual living spaces. Many of these interiors are equipped with a variety of adaptations designed to be used by elderly people. This would normally consist of flats and have a much wider range of facilities, such as a common room and laundry. These are served by a warden control system and frequently equipped with alarm systems. A major concern to be addressed by the provision of the schemes' self-contained or shared accommodation is that elderly people be enabled to live as independently as possible while at the same time having a greater sense of security than would be experienced in an ordinary housing environment (Leicester City Council Sheltered Housing Department 2005). The category 2 & 1/2 accommodation, Extra care or very sheltered housing provided by sheltered housing schemes comes with a wide range of adaptations and other features designed for use by frailer older people and in which a greater range of care services are provided on site. The third category is the Care homes or nursing homes, which provide personal and nursing care 24 hours a day for people who are bedridden, very frail or have a medical condition or illness that means they require regular attention from a nurse. Further detail on each type of housing is described below.

Additional specialized housing provided for elderly people in the UK includes: Abbeyfield supportive houses; intermediate care homes; shared homes or group homes; granny annexes; hostels and wheelchair housing.

The details of the 3 main categories namely, Sheltered housing schemes, Extra care housing and Care homes (or Nursing home) are described in the following section.

2.5.2.1 Sheltered housing schemes

Sheltered housing schemes are frequently termed as retirement housing with a minimum age required to live in them. In general residents need to be aged at least 55 or 60 years of age (Age Concern 2005). Essentially, sheltered housing is designed to meet the specific needs of the elderly and comprises a series of unfurnished self-contained flats. The major function of the service is the responsibility of providing safe, secure, easily managed accommodation for older and vulnerable people. It should also employ sheltered housing staff in order to provide additional support. Many residents of these schemes report that residing in a shared building enables them to enjoy a variety of activities and, also, that it provides them with a sense of community. Furthermore, sheltered housing can be seen to make available affordable independent living for elderly people requiring low level support. Moreover, it should accommodate the growing number of older people wanting to experience more independence in their everyday lives. The newly designed innovations will often assist elderly residents by providing interiors that are more user friendly and comfortable and take less time and energy to maintain. In addition, they will enable the elderly residents to live independently in their own self-contained flat, whilst also receiving the help and support they need in a familiar and friendly community setting.

Schemes usually consist of between 20 and 40 flats which may be bedsitters, self-contained flats, bungalows or luxury apartments. In the description of the flats, a one-bedroom flat is a self-contained flat with one bedroom, living room, a kitchen, bathroom and a small hall area near the entrance. A studio flat is smaller and has kitchen, bathroom, and bedroom-cum-living room. All schemes have communal gardens, which

residents can enjoy in the good weather. In addition, there are common areas such as a laundry and common shower room. Also there are communal lounge areas where residents can meet and chat. Some schemes have a guest bedroom which can be rented out if family or friends of the resident want to visit.

Moreover, to ensure all tenants' well being, most sheltered and retirement housing schemes have a scheme officer or warden. The sheltered housing officers contact tenants on a daily basis and are usually expected to manage the scheme and respond to the emergency alarm when on the site. However, the duties vary considerably between schemes. While some have a resident manager/warden, an increasing number have non-resident staff. These offer a 24 hour emergency alarm service providing reassurance that help is at hand if needed, and, therefore, enables the service users to retain their independence and give both them and their families & carers peace of mind and confidence. The alarm is relayed to a monitoring centre, staffed 24 hours a day. If help is required the centre will alert relatives or friends, or contact the resident's doctor or the emergency services.

The majority of sheltered housing is provided by local councils (73%) with non-profit making housing associations providing most of the remainder (23%) both aimed at offering their housing to people with the greatest housing need, at rents which are affordable (Housing care organization 2004). In addition, the major reason elderly people choose sheltered housing schemes is because they do not wish to lose their independence, which is fostered on special design and interior layout which compensate for certain abilities and skills which have been lost or damaged (Stokes 1992). At the same time they want the reassurance of knowing that assistance is on hand if there is an

emergency. In addition, unless the resident becomes considerably disabled, there is a low propensity for tenants to leave sheltered housing to enter Extra care housing or care homes (Stokes 1992).

2.5.2.2 Extra Care Housing

Extra care or very sheltered housing is an exciting addition to the range of housing and services available to older people in the UK that is filling an important gap in the elderly care industry between sheltered housing and care home (Extra Care Housing organization 2007). It provides a more intensive level of support than standard sheltered housing. Extra Care Housing is designed with the needs of frailer older people in mind and with varying levels of care and support available on site. These will suit older people who need a high level of personal care or support, but who are otherwise able to live independently on their own.

A number of these schemes are government funded, with strong investment by both public and private sectors in Extra Care Housing development for the elderly. This type of housing comes in many built forms, including blocks of flats, bungalow estates and retirement villages. It is a popular choice among older people because it can sometimes provide an alternative to a care home (Housing Care organization 2006).

Furthermore, Extra Care Housing is designed to cater for frail older people who have physical or mental health difficulties, either living on their own or with a partner. The aim of this is to promote independence as much as possible.

Extra Care Housing offers independent living with professional staff on site, and an

emergency alarm system to meet needs flexibly 24 hours a day. People who live in Extra Care Housing have their own self contained homes, their own front doors and a legal right to occupy the property. Inside each flat, each resident usually has their own kitchen, bathroom with walk in showers, bedroom and living room, and all rooms have emergency pull cords which connect to a member of staff at the scheme. The flat is very likely to have been built with older or disabled people in mind, so it will be user friendly and easy to navigate (Counsel and Care 2007). Community facilities such as communal lounges, hairdressing, laundry and library services are often provided. Some schemes offer more, such as a restaurant or cafeteria, a shop and guest room. Domestic support and personal care are available and can be arranged for someone to have, for instance, a visit from a carer in the morning to help someone out of bed, get washed and dressed, or into bed in the evening. Usually Extra Care Housing provides support services with on-site staff available 24 hours a day, to give the residents peace of mind. There is a limited amount of Extra Care Housing in most areas and some providers are likely to set eligibility criteria which prospective residents have to meet. However, Extra Care Housing schemes do not necessarily suit all elderly people, particularly those with severe disabilities such as dementia or people who have multi-disabilty or major illness and moving to a Care home might be the next logical choice.

2.5.2.3 Care home

The National Health Service (NHS) defines Care homes or Nursing homes as those residential homes which provide nursing and personal care, in addition to living accommodation. The main emphasis of most of these settings is based upon a traditional

medical model. They are concerned less with cognitive impairment and more with the provision of skilled nursing care for residents with physical illness (Williams and Trubatch 1993). They provide care during normal short illnesses but do not provide constant nursing care. Care homes may be owned and operated by private individuals, companies, non-profit organisations and local authority social services departments (Age Concern 2005).

Care homes vary greatly in size and the amount of facilities they offer. All are expected to provide living accommodation and assistance with personal hygiene, including help with bathing, dressing and shaving etc. Other services, including assistance with toileting, skin care, laundry and bed changing are all provided. In addition, they offer food and diet programmes, including preparation of food and assistance with eating etc. Most important is that they always have a qualified nurse on duty to provide personal and nursing care 24 hours a day, particularly for people who are bedridden, very frail or have a medical condition or illness that means they need regular attention from a nurse. Many also provide more specialist dementia care (Housing Care organization 2006).

The Royal Commission on Long Term Care (1999) has highlighted the fact adults in the United Kingdom are now entering Care homes at a later age. The statistics show, in particular, that there are one in four people over 85 likely to move eventually into a care home environment. In a majority of cases, elderly people move to nursing homes because they or their families recognize a need for a setting that can provide around-the clock support, and care that cannot be provided in the home. If the older person has a severe illness and is bedridden or requires frequent medication, the move is more likely

to be involuntary. Additionally, due to significantly reduced funding and the problems associated with discharging older patients from hospital, the availability of places in care homes has been consistently falling (Vegeris et al. 2007).

2.5.3 Regulation and standard for special building

In most countries, housing for the elderly is subject to stringent regulation. Existing standards in the UK related to building for the elderly people include Health Facilities Note 19 (HFN 19) from the Department of Health (Sealy 1998), which provide design solutions and aims to promote quality design standards facilitating good care for elderly people living in a residential care environment. Similarly, The Health Building Note series by The Stationary Office is intended to give advice on the briefing on the design of health buildings. Moreover, the Building regulation Part M (Access to and use of buildings; in Scotland, Technical Standards Part T) relates to the design data of space requirement on the access of the building including special requirements such as wheelchair turning circles etc. Furthermore there are regulations related to health and safety, fire safety, Disability Discrimination Act 1995, as well as policies applied by individual local authorities.

These particular standards effectively cover whole areas of the building, including communal areas; residents' flat, staff workspaces and finishes, fixtures and furniture as well as external environment. The principal aim of these guides and standards is to qualify the housing environment for the people with special needs. These standards not only concern building accessibility for people with differing levels of physical limitations but also should be used to promote consistent, high quality design standards facilitating good care and quality of life.

In addition, considerations for the assistance of particular client groups are included within most standards and regulations. Wheelchair users, for instance, are invariably covered by these standards as there is a likelihood that in most sheltered

housing accommodation a proportion of the residents will need the assistance of a wheelchair. Therefore, it is important when designing these schemes that provision is made for easy access and circulation for residents with wheelchairs and other relevant supplementary equipment. Further, the adoption of ergonomic criteria assists the design of the spatial environment in order for residents to interact with them for the maximum possible amount of user satisfaction.

The environments provided should achieve the various standards outlined above to offer a well-designed living space and generally improve the well being of elderly residents. However, those regulations and standards sometimes only take into consideration the physical aspects of their needs, covering such requirements as size of rooms, accessibility, facilities, furniture and fittings. Thus it is often the case that they omit the inclusion of the resident's social and psychological needs. Therefore, understanding and appreciating the influence of the environment to elderly people and their perceptions will be essential to provide a quality living environment and, hence, improve their quality of life.

2.6 Conclusion

Recent study by Burnett (2005) revealed that, in the UK, there is a large proportion of elderly citizens living independently, experiencing isolation and having little or no social interaction outside of their own home. More specifically, this highlights the fact that the design of interior environments is extremely important in the experience of older people in their later life. It should be acknowledged that there has been some increase in the research concerned with elderly peoples' perceptions. Nonetheless, it is quite evident that there is a distinct lack of empirical literature related to the perception of elderly people regarding interior space. Indeed, a majority of this work, carried out by government bodies or other associations involving elderly people, has been mainly focused on a broader social perception and centered: on residential services, quality of care and policies etc. (Parry and Tompson 1995; Sumner 2002) or the quality of residential homes for old people (Riseborough and Jones 2005), rather than with the more relevant design of interior environments and people's perceptions toward them. Finally, then, the review of the literature in this chapter has provided background knowledge to support the research. It is important therefore, to clarify the main issues identified in this literature review. These are as follows:

1. There is an apparent lack of empirical literature related to the perception of elderly people, regarding interior space.

2. Ageing can have a profound effect upon an elderly person's ability to adapt to their surroundings (Marsh 1980; Stokes 1992).

3. Good design of interior environments, for elderly people, is vital, particularly when faced with the decline in their physical and psychological ability (Miller

and Schlitt 1985, Heerwagen 2004).

4. The involvement of elderly people as participants at the centre of the research is extremely beneficial (Bate and Robert 2006; Black 2006).

5. It provided relevant information on recent housing options for elderly people, as well as the regulations and standards relating to sheltered housing schemes.

The detailed discussion on the research process of each method used, along with its aims and objectives, are set out in chapter 3 and 4, with the results acquired presented in chapter 4.

CHAPTER 3.

METHODOLOGY

3.1 Introduction

Studies concerned with environmental perception have been an active and important area of research within the discipline of environmental psychology. More specifically, there are a number of methods that have been identified in order to extract environmental cognitive information. Golledge (1976) characterizes four distinct methods for the "extraction" of environmental cognition information: (1) experimental observation in naturalistic and controlled situations; which involves tracking people through actual environments and observing their responses in the environment. (2) Historical reconstructions; which aims to show people's environmental knowledge from written descriptions and attempts to reveal what the selected authors know about the environment that they are discussing. (3) Analysis of external representations, which require the subject to produce a "self-report" of information by using verbal and written descriptions, sketches, photo recognition and model making etc. In particular, the drawing of a sketch map was the most widely used self-report technique to express people's perception of the space based on their memory of environment (Moor 1975; Rovine & Weisman 1989). (4) Indirect judgment tasks. For example, the subject may be provided with a selection of adjective check lists and asked to select one that best describes their "feeling" about a specific space.

As the aim of this study was to adopt a multi-method approach in gathering information from the elderly subjects, the author assessed the subject's cognitive map[17] through observation in naturalistic situations and the analysis of external representation

[17] Cognitive map: "…a process composed of a series of psychological transformations by which an individual acquires, codes, stores, recalls, and decodes information about the relative locations and attributes of phenomena in their everyday spatial environment" Downs and Stea (1973)

by used 4 distinct methods, which include: Visual Record survey (VRS)[18], Sketch Map survey (SMS)[19], Detail Recall survey (DRS)[20] and User-centred Conversational Tour (UCCT)[21]. The background literature concerning the four methods used in this research with the detailed process of each methodology is described below together with the method for data analysis.

[18] VRS: Refers to the Visual Record Survey method used in this study.
[19] SMS: Refers to the Sketch Map Survey method used in this study.
[20] DRS: Refers to the Detail Recall Survey method used in this study.
[21] UCCT: Refers to the User-centred Conversational Tour method used in this study.

3.2 Visual Record survey (VRS)

Body language or non-verbal communication, is said to account for most of our total communication with the other being made up by spoken language or verbal communication (Trompenaars and Hampden-Turner's 1997). Indeed, these can often let us down when we are trying not to give away how we are truly feeling about ourselves or the people or person to whom we are talking (Fast 1971). Accordingly, many approaches for detecting a person's behavioural responses to their environment and their viewing strategies employ observation as the main method. It appears, however, that observation in itself presents some difficulties. For instance, the way in which we apply attention to one task or another can be seen as a psychological problem as there is often no external sign that a person is or is not paying attention (Norman 1976). Therefore, for an outside observer, it becomes very difficult to ascertain which interior design elements or spatial areas the subjects pay attention to whilst investigating an unfamiliar interior environment (in this case, the sheltered housing scheme).

Nevertheless, research from the cognitive field goes someway into dealing with these difficulties. Studies by Puff (1982) employed the parameters of eye movement patterns as variables to investigate various cognitive processes, including reading, decision making, and picture processing. Therefore, observation of eye movement might provide a remarkably convenient methodological tool to understand how people observe space and the viewing strategies they adopt. One previous study from Yarbus (1967) observed subjects' viewing strategies of pictures. By presenting the pictures to subjects and recording their eye movement and fixations the data effectively provided an indication of how the observer's attention has been allocated over the picture. However, it should be pointed out that when we are scanning the visual world for

information (e.g. when walking around a building), it is more common that people require head movement rather than eye movement. In particular, research into age-related changes in head and eye coordination indicate that, when compared to younger subjects, elderly people increase their head movement tendencies during a number of simple visual tasks (Proudlock et. al. 2004).

Furthermore, in relation to perceptual selection research, Carr and Schissler (1969) developed a head-mounted eye camera system to record precisely those elements in a real environment that were viewed by a number of car drivers and their passengers. The recorded image allowed the researcher verification of what was reported by each subject, thereby enabling a study on the influence of urban form on environmental cue selection and way finding. These strategies are explored further and applied in the latest marketing research. ID Magasin (2005), the shopping behavior specialist, has launched a new marketing research tool which measures advertising effectiveness objectively across all media. It is called the "Eye Contact", and is an audio-visual recording device contained in a pair of glasses which have a tiny camera attached along with a battery pack. The hard disk recorder is strapped to the waist on a belt. All this equipment is worn by the participant in the research, with the capability of capturing on video everything that they see throughout their visit to a supermarket. The tool is used to record customers' behaviour during a shopping journey and documents all the promotional messages that they are exposed to, whether above or below the subject's eye line. Each volunteer is interviewed after the journey to establish which, if any, of the advertisements that she/he could have seen or heard are recalled. Then the data is analysed to determine which advertisements have the most impact on consumers and to identify which elements of which campaigns are the most effective for which

demographic groups. In addition, ID Magasin (2005) states that, by using the "Eye Contact" device, a more accurate identification is revealed of what shoppers see and which elements they consciously and subconsciously select in their decision making process.

The same technicque was also used by the Guardian news and media limited in 2005 to explore the effectivness of outdoor adverts in the west end area of London. The Guardians' research subjects wore "Eye Contact" glasses for four hours, recording a bus and tube journey to Oxford Circus and a shopping trip through Bond Street. Analysing the footage, they used the time the subjects spent scanning each advertisement display to identify the effectivness of the advert. It was concluded that by employing this method, the researcher would be able to gain a better understanding of the consumer and, therefore, produce a more effective advert (Guardian 2005). Therefore, with the similar intentions of this research, a device, namely, "Visual Witness glasses" (VW glasses)[22] was built by the author to accommodate the research purpose. By recording a subject's view through their head movement during the visit tour it was hoped to detect how elderly people investigate their immediate environment and which areas or elements they pay particular attention to. As the camera has no selectivity; it documents exactly what participants see (Rich et al. 2000).

3.2.1 Protocol

The principal aims of this method were to explore how elderly people observe/inspect unfamiliar spaces and reveal their awareness of these selected spatial areas by calculating the time they spend in each area. Furthermore, this method is aimed

[22] VW glasses: Refer to the Visual Witness glasses used in this study.

at revealing some of the behaviours that the participant's exhibit when exposed to an environment comprised of the five selected individual spatial areas[23] within a sheltered housing scheme. In order to achieve the aims of this method, the objectives were:

(1) To take the participants to an unfamiliar sheltered housing scheme and record the visual images and verbal information throughout the duration of their visit.

(2) To code each recorded video with a time line.

(3) To determine the similarity of the participants' behaviour from recorded video and to calculate the average time the subject spent in each selected spatial area.

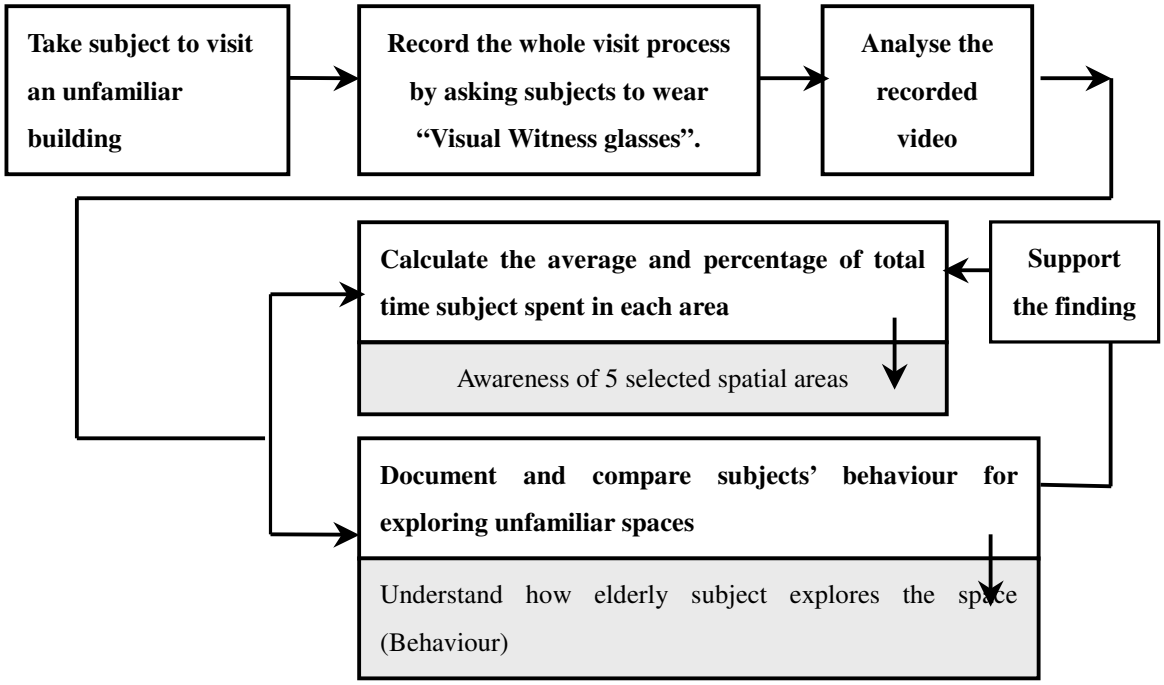


Figure 3.1. Outline of Visual Record survey process

(4) To form conclusions

The survey process is outlined in figure 3.1. (P.101) For this, the researcher required the participants to visit a sheltered housing scheme unfamiliar to them.

[23] Five selected spatial areas: entrance area, common room, common kitchen, laundry and common shower room.

Moreover, they were asked to assess the site while imagining that they were looking for a new accommodation to move into. To facilitate this, the participants were allowed to spend as much time as they needed to explore the building interior, particularly those areas they were most interested in.

In order to create a recording of the whole process, Visual Witness glasses (VW glasses) (Figure 3.2.; P.103) were constructed by the author for use in this research. Central to this device was the ZTV-830U wireless USB camera, used to record real time visuals. The camera has a resolution of 380 lines with high speed MPEG4 compression supporting real time image output and is able to run on its own built-in rechargeable battery. Through the CCTV software it can transmit 2.4GHz frequency live colour video with sound transferred directly to a PC hard drive. It is purposefully designed in a small size (25 x 35 x 14mm) for discreet observation & portability. Thus, to create a valid record of what participants see in real time, the camera apparatus was attached to a pair of glasses and worn by the participants throughout their visit to the building. The effectiveness of using this particular equipment is that its positioning enables the camera to operate in direct response to the head movements of the subject. This ultimately provides a more precise record of what the participants are able to see. Furthermore, according to the instruction manual, the built in transmitter has a range of approx 75metres, dependant on obstacles. However, after the pre-testing exercise, the researcher discovered that it was not powerful enough to ensure a good quality picture through walls, ceilings and floors and the average transmitter distance would be approximately 5-10 metres indoors. Nevertheless, it should be stressed that this is more than adequate power for the researcher to maintain a short but discreet distance from the participant, while moving through the building. Therefore, any distraction from the

Figure 3.2. Visual Witness glasses (VW glasses)

researcher would be effectively avoided.

In addition, according to a previous study by Sherman & Craig (2003), normal field of view for humans is approximately 200 degrees, with 120 degrees of binocular overlap (Figure3.3). Hence, the chosen wireless camera incorporated a 3.66mm lens offering a 62-degree view to record the centro-view (focus point) from subjects.

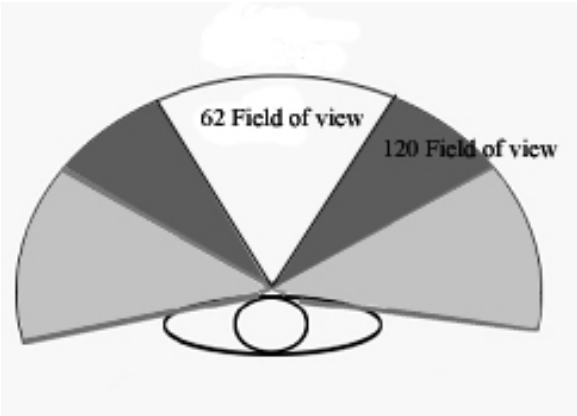


Figure 3.3. Human field of view

Subjects were required to wear VW glasses throughout the visit. Moreover, as the camera has no selectivity, it could be said to document exactly what participants see during the visit without inaccuracy. Following the visit process, the image was then transferred and recorded from the VW glasses, wirelessly, to a laptop for subsequent analysis.

In addition, all narrative information relating to the participants' perception of the spatial environment, during the visit, was recorded onto a digital voice recorder. This information was then combined with information from the User-centred Conversational Tour to identify the subject's perception of the space, the details of which are set out in section 4.7.

- **Visual record analysis method**

Research using recorded video to measure advertising effectiveness has previously been carried out by ID Magasin (2007). Their research used filming-based methodologies to record customers' behaviour during a shopping journey. More specifically, the recorded video revealed qualitative data on penetration and conversion rates along with the nature and duration of customer interactions. In order to provide an effective analysis of the recorded video, each participant was interviewed to establish which of the advertisements, they were exposed to, could be recalled from their memory. Furthermore, the video recording was reviewed to make comparisons with the participant's shopping behaviour throughout the journey. Therefore, the combination of interview (memory recall) and video record was employed to find out which advertisement had most impact and influence on customers buying behaviour. Similarly, the study by the Guardian news and media limited (2005) aimed to explore the effectivness of outdoor adverts. In order to analyse the footage and to identify the effectiveness of the advertisements in the study, the researchers recorded the ammount of time the subjects spent in scanning each advertisement display. The researchers also tested the subject's recall of the advertisements they had seen earlier.

Therefore, for this research, the adoption of these methods to analyse the video footage could, effectively, be used to reveal the subject's awareness and prorities related to spatial areas. Essentially, this would be achieved by both recording and calculating the time each subject spent in investigating the 5 selected spatial areas. In addition, the supporting recorded footage could be reviewed to make comparisons with the subject's behaviour and attitude toward individual space. Accordingly, the visit routes followed by the individual subjects were compared to identify similarities in the manner in which they observe space.

3.3 Memory Recall

Two particular memory recall methods were used for this study, these being: Sketch Map Survey (SMS) and Detail Recall Survey (DRS). The SMS was employed to determine the participants' awareness of the layout and spatial arrangement of the individual spatial areas and the DRS was used to identify the awareness of the five selected design elements in those areas. Results were combined together to prioritise the selected spatial areas within the scheme. In addition, the SMS was also used to identify the participants' perception towards the scheme and the DRS was used to determine the order of priority regarding the selected design elements. A brief description of the process and method used for the analysis of these two methodologies are discussed below.

3.3.1 Sketch Map survey (SMS)

Rosen and Purinton (2004) explain that "people deal with processing information through the use of cognitive maps and this provides us with a means of sorting and storing information from our environment". Moreover, Kaplan and Kaplan (1982) state that the cognitive maps are an accumulation or summary of experiences and influence "how the environment feels to that person, what is noticed, what is ignored". Kitchin (1994) refers to Kaplan's research on cognitive maps and maintains that rather than designers relying on intuition, rule-of-thumb or details from past work to design and plan future environments, the data acquired from studying a cognitive map would greatly assist in the decision making process of the design.

There are a number of methods that determine recall of an individual's cognitive

maps of a space. For example, verbal description, writing or drawing etc. However, research on the recall of pictures by Puff (1982), points out that the major difficulty with recalling pictures (in this case environment) is that recall is essentially a verbal act, and, therefore, a successful recall will require the individual to extract the information from pictures which are not originally stored in verbal form. Further, he indicates that, a possible solution to avoiding the verbalisation problem is to enable the subjects to draw representations of the pictures that they believe they have seen. As the aim of this research is to understand the participant's awareness and perception of the space, in 3 dimensional form, the Sketch Map method would be a suitable approach in the investigation of people's perception of the space.

Additionally, drawing technique was used in the field of way finding research. In one particular instance of way-finding research, Passini (1984), required the participants to produce sketch maps following a short journey around a building site. In order to reproduce the information, each person had to re-enact the planned route and reproduce what he had seen on her/his trip. Therefore, this can elicit what the space represents to each individual. A similar procedure was employed by Rovine and Weisman (1989) who argued that the Sketch Map was the best predictor of way finding performance. In addition, those items (elements) that are emphasised in the drawing can be taken as the focal point and enable the person to make effective decisions on the way-finding task.

Most importantly, sketch map drawing technique has been used for studying people's perception of their environment and taken to externalise an individual's environmental representation. In fact, sketch maps have been more frequently used as a primary method for collecting sources of information on individual's environmental

knowledge in the field of architecture or urban planning (Wood and Beck 1989; Billinghurst and Weghorst 1995). In order to gather the information, individuals were asked to produce a drawing based on their memory of environment. A recent study on the use of sketch maps by Billinghurst and Weghorst (1995) demonstrates that the accuracy of sketch maps can be utilised as an external measure of a person's orientation and world knowledge. Moreover, Blades (1990) explains that those features that are absent from the map may reflect either, a lack of knowledge or deliberate selectivity on the part of the subject. In addition, Blades tested the reliability of the sketch map as a source of individuals' environmental knowledge by asking the participant to draw the same map twice at different times (one week interval). The results demonstrate that the reliability of the drawing will not be significantly affected by this relatively short interval. However, familiarity had a marked effect on how much information was included in the sketch maps. Indeed, the more familiar the individual was with the environment the more detail was included in the drawing. Spencer and Dixon (1982) suggest this might, also, be related to the subject's involvement and interaction with particular places.

Furthermore, this method was adopted by Millar (2006) in interior architectural research to detect the spatial understanding of groups of adults and children. She asserts that an expression of an individual's cognitive map is derived from drawing a sketch map, and, therefore, influences their perception of the space around them. Moreover, an analysis of the research subjects' drawings reveals that it is possible to identify what are the important elements for the individual as these are clearly displayed on their drawings. Similarly, Wood and Beck (1989) used sketch map drawing to find out people's perception of a city environment. They concluded that by using Sketch map

drawing, more specific information could be gathered regarding the perception of space. Moreover, the information recorded on the maps was also used to draw conclusions about the spatial representation of an individual's emotional response to the environment (Spencer & Dixon 1983; wood& Deck 1989).

Therefore, even though most of these research studies are focused on large-scale environments, such as cities, neighbourhoods etc. their findings demonstrate that sketch maps are a reliable and effective method of data collection. Thus, for the purpose this research, the Sketch Map method was adopted and utilised to investigate the perceptions of elderly people in sheltered housing environments. However, Golledge (1976), Blades (1990) and Millar (2006) maintain that by using this procedure, another major difficulty is highlighted as the success and reliability of this method not only relies on the orientation ability of the individual, but also their cartographic knowledge or skills, and in some cases their memory capacity. In addition this confounds efforts to measure or categorize the exact information contained on the maps. Furthermore, it could be argued that the results of this approach would prove difficult to interpret and quantify. Therefore, to overcome these problems Sanoff (2005) recommended to Millar that a more interactive approach may be more effective. Sanoff suggested that by asking each participant to describe what he or she was drawing, throughout the drawing process, would facilitate a more reliable and informative response.

Additionally, it is believed that using and thinking about diagrams may actually assist people in having a greater understanding of space and, also, enable them to think more about spatial relationships (Uttal 2000).

3.3.1.1 Protocol

The Sketch Map technique was utilised to test the subject's cognition of each of the selected spatial areas, both relative to their own scheme and the visited one. Its aim was to determine the participants' awareness of the selected spatial areas and, moreover, reveal their perception of the individual spaces. Using this approach, the procedure was divided into two separate days, taking into consideration the elderly subjects' physical condition. The objectives for each day were as follows:

First day:

(1) To take the participant to visit an unfamiliar sheltered housing scheme.

(2) To ask the participant to produce a drawing of their own scheme including space arrangement of each individual area from their memory.

(3) To compare the subjects' drawings with the building layout.

Second day:

(1) To ask the participant to produce a drawing of the spatial arrangement of each individual area of the visited scheme from their memory.

(2) To compare the subjects' drawings with the actual building layout.

(3) To analyse the results from the two drawings including: overall recognition of the space; object recognition and relationship between the object that the subject recalled for each spatial area; the order followed in the drawing process of each area and any apparent similarities between the subjects.

(4) To form conclusions

The research process is displayed in figure 3.4. (P.111) To yield more accurate results, the Sketch Map survey was employed twice to produce an average score. This

entailed all subjects visiting an unfamiliar scheme and, entirely from memory, producing a drawing of the five selected spaces within their own scheme, following instructions provided by the researcher. Also taking into consideration the elderly persons' physical strength and to enable them to have adequate rest, they were asked to attend on a second day. On this day of the research each participant was asked to produce a drawing of the visited scheme while they were situated in their own scheme. Between those 2 drawings the subjects were not allowed to see the visited scheme. The reason for this particular approach is made clear as Blades (1990), Wood & Beck (1989) suggests that subjects increasing familiarity with an area may contribute to altering their environmental knowledge and, more importantly, could affect the reliability of the

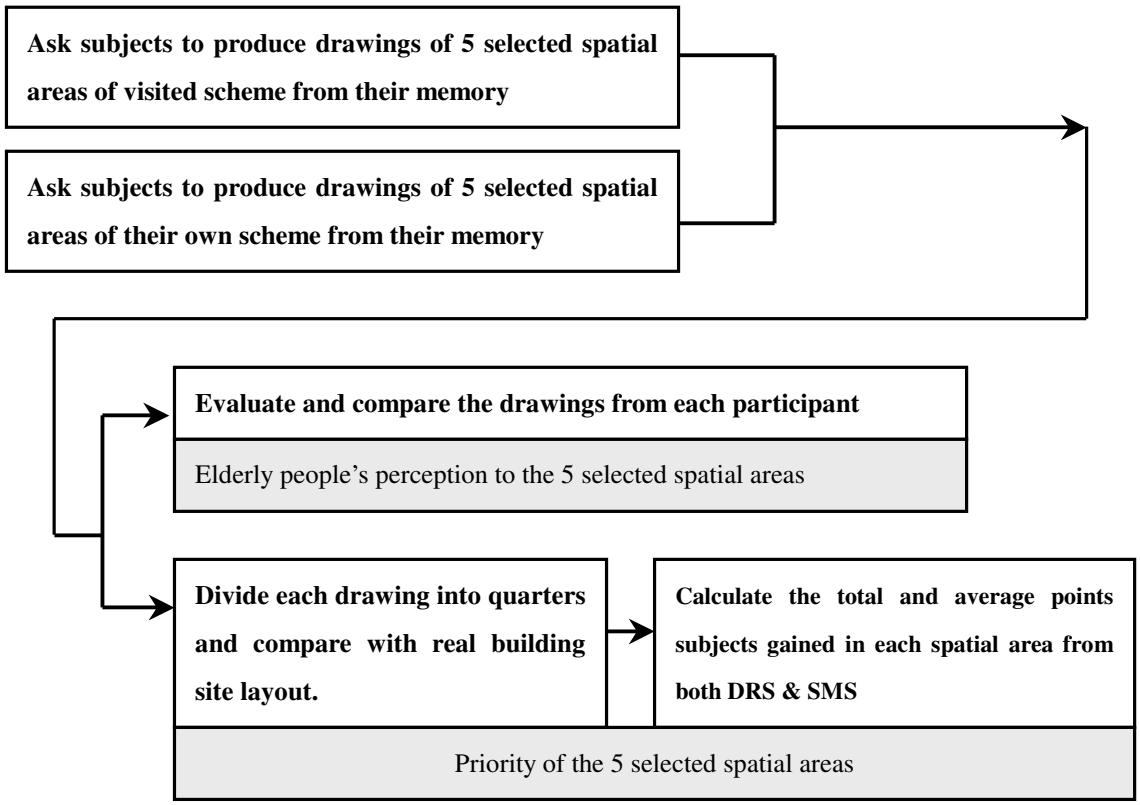


Figure 3.4. Outline of Sketch Map survey process.

collected data.

Additionally, subjects were encouraged to use any available drawing instrument. The entirety of the drawing process, including the order of drawing and narrative explanation, was recorded onto digital video in order to assist with the results analysis. It is also important to note that the subjects were afforded as much time as they needed to complete the drawing.

Furthermore, the Sketch Map method was also applied to explore each elderly subject's perception of the selected interior spatial areas (detailed in chapter 4.7). Each individual drawing, coupled with the drawing process on the recorded video, was analysed to elicit each subject's perceptions of the spatial area. The details are outlined later in this chapter.

- **Sketch Map analysis method**

The Sketch Map requires individuals to state their knowledge of particular places or reconstruct representations of that knowledge. Rovine and Weisman (1989) maintain that the results of this method will indicate that either what is not on the map is not known or what is not pointed out is of relative insignificance to the individual subject and consequently, does not warrant appearing on his final representation. Therefore, one of the challenges posed by using sketch maps is being able to satisfactorily analyse the results. As each individual possesses a distinct personal cognitive map, all drawings can be seen as unique and, therefore, there would appear to be no generally accepted method for them to be analysed (Billinghurst and Weghorst 1995). Similarly, Millar (2006) and Blades (1990) argue that it is difficult to score the performance of each drawing and it is

even more problematic to interpret and quantify the results.

One useful approach such as way finding research by Billinghurst and Weghorst (1995) used simple techniques to analyse the sketch map. He applied a scoring system to the maps in accordance with 3 main factors: “goodness” (usefulness of maps as navigational tools), “object classes” (number of object classes present) and “relative object positioning” (relative positioning of present objects). In addition, Billinghurst and Weghorst (1995) expresses that it is important to ignore the participant’s drawing ability and focus more on how well the map represents the environment and the locations of the object therein. Another study by Millar (2006) used both quantitative and qualitative methods to analyse the sketch drawing. In the quantitative analysis, she highlighted 12 key nodal points within the building of drawings based on her first hand experience and understanding of the drawing plan, which provided with a comprehensive overview of the space. Scoring was applied according to those nodal points and these results were then quantified. In relation to the qualitative analysis, Millar was exploring the detailed meaning of each drawing including: containment of space, drawing style and space layout/arrangement etc. In addition, Rovine and Weisman (1989) suggest that the drawing can be broken up into small units to elicit the sketch map information. Accordingly, as the aim of this research was to determine the elderly subject’s priority of selected spatial areas and their perception to them, similar methods (both quantitative and qualitative) were conducted to measure the subject’s awareness of individual space via a quantitative approach (scoring system). Moreover, the qualitative approach would help to determine the detailed meaning of each drawing and, therefore, go some way into understanding the individual’s perceptions.

Therefore, as the aims of the method, essentially, were to help reveal the priority of

the selected spatial areas as perceived by the respondents and, moreover, to understand how each spatial area is represented by the elderly subjects. Therefore, an adoption of the quantitative methods was applied to this research in order to find out the priority of the selected spaces. Individual comparisons were made of each drawing, with the building layout and photos of each individual space. These comparisons were carried out by the researcher and an architect who is experienced in space planning design. Then, each drawing was divided into quarters and was analysed and scored with reference to three main elements: object recognition, relation between objects and the overall recognition of the space, all of which are detailed below:

Object recognition

With all the individual spaces containing a variety of objects (mainly furniture), each drawing was ranked for object recognition, on a scale of 1 to 4, in accordance with the number of objects participants could remember. The scoring was assigned by the number of the items that they incorporated in their drawings, these were then compared with the real environment. Therefore, the aim of this approach was to understand the elderly subjects' awareness of each object, within the individual spaces, through an assessment of their sketch drawings.

Relation between objects

The scoring, here, (1 to 4) was given according to the position and the relationship between the objects that participants correctly identified in their drawings. The aim, therefore, was to compare the subject's recognition relative to individual objects and their spatial organisation.

Overall recognition

Each of the drawings was divided into quarters, with 4 points applied if the content of the objects were correct as well as their position within the drawing. Assessing each of the subject's sketch drawings, therefore, would assist in achieving the aim of understanding the priority of each selected spatial area within the scheme.

In order to further assess the perception of the elderly subjects, a qualitative method was also used. This involved the analysis of each individual drawing produced: the order followed in the drawing process of each area and scale. Moreover, the similarities between subjects were analysed and conclusions were formed. The results of this are set out in chapter 4.7.

3.3.2 Detail Recall Survey (DRS)

Lawson (2001) defines perception as an active process through which we make sense of the world around us. He states that the processing of visual sensations into perceptions of the environment around us involves a complex interaction through the sensations of vision, sound, smell and even touch. Furthermore, since over two-thirds of the nerve fibres that enter our central nervous system are from the eye, visual experience and visual memory can be seen to play a pervasive and dominant role in everyday activities. Moreover, as people inhabit very complex physical environments and we spend a lot of time moving around from place to place, the brain responds only to certain selected visual features and the information-processing system cannot react to all the sensory stimuli it is exposed to and, therefore, highly selected but unimportant

features were often ignored (Lawson 2001). Initially, information is passed from sensory memory into short-term memory by a process of attention. In order to effectively process this information selectivity is required so that all unimportant stimuli can be detected and discarded (The College of Computing at Georgia Tech 2006). Hence, Stokes (1992) provides a useful and valid definition of what is termed Selective attention. He states that "selective attention is the means by which a person actively filters incoming stimuli to determine whether or not they are relevant and filtering the stimuli to only those which are of interest at a given time". In other words selectivity, in this instance, can be seen to enable the individual to process only information that is of immediate relevance and, therefore, assist them in making coherent choices in patterns of their behaviour.

Additionally, the memory system is only able to cope with a massive amount of unique information by being highly selective and allowing for the rest of the information to be effectively filtered out. In general, it can be argued, that unless we attend to a stimulus we are less able to remember and make an appropriate response to it. In order to remember information we must attend to it, even though we need not attempt to remember it intentionally (Underwood 1976). Remembering is typically defined as the retrieval of information that has been stored in memory. Memory is discussed in terms of information, that is, how you put information into a "system," how you store it, and how you retrieve it (Schair and Willis 2002). It is essential that we are able to retain and retrieve information if we are to make sense of the phenomena we experience and adapt to the demands of everyday life. Cavanaugh and Fields (2006) maintain that, to remember something is based upon a progression of fundamental processes: encoding, activation, decay or inactivation, retention, reactivation, and context-dependent

retrieval.

While it is true to say that memory is impaired with increasing age, memory never functions perfectly even in younger adults. An inability to remember in old age cannot therefore be regarded as inevitable evidence of the destructive process of ageing (Stokes 1992). This statement can be further qualified, to some degree, by other relevant research. Rabbitt (1988) reported that cross-sectional survey data on a population aged between 50 and 96 reveals only slight and progressive deterioration in memory efficiency as people grow older. The results demonstrate that, in relation to deterioration of memory, there is little apparent difference between people in the fifties or sixties age groups and, moreover, is even applicable to a proportion of adults in their late seventies. However, distraction and minor sensory losses in old age can create or exaggerate a memory deficit. Moreover, West et al. (2002) discovered that the time of day chosen for testing people's memory ability could possibly have an effect on their memory performance. The result shows that older adults report being relatively more alert in the morning, while for younger adults the evening is when they are at their most alert. Therefore, it is clear that testing at a different time of day can accentuate age differences.

Furthermore, attention plays an important role in human memory. If you pay attention, the judgment will better perceive the things going through it. This is a common idea. An attention mechanism will select some information for further processing by a central system and possible long-term storage (Norman 1976). Detail has passed through our sensory memory repeatedly but because we failed to pay attention it will leave no traces behind (Norman 1976; Cavanaugh and Fields 2006). We

will normally remember what is useful and important while unimportant features are ignored (Cohen 1989, Malim 1994). Therefore, this research develops these theories further and applies them to the methodology in order to detect the elderly person's awareness of the spatial areas and the elements within the sheltered housing scheme.

3.3.2.1 Protocol

In order to obtain more information on elderly person's awareness of selected design elements within five selected spatial areas, a Detail Recall test was employed to test the subjects' memory about detailed interior elements in their own scheme and the visited one. To achieve this, the objectives of this survey were:

(1) To design a questionnaire for testing the subject's detailed memory of design elements within both their own and the visited sheltered housing scheme.

(2) To take the participant to visit an unfamiliar building.

(3) To test the subjects' detailed memory of their own sheltered house scheme.

(4) To take the participant back to their own scheme.

(5) To test the subjects' detailed memory of the visited sheltered house scheme.

(6) To analyse the information including: comparing the subjects' answers with the real site situation and compare the results between subjects.

(7) To form conclusions

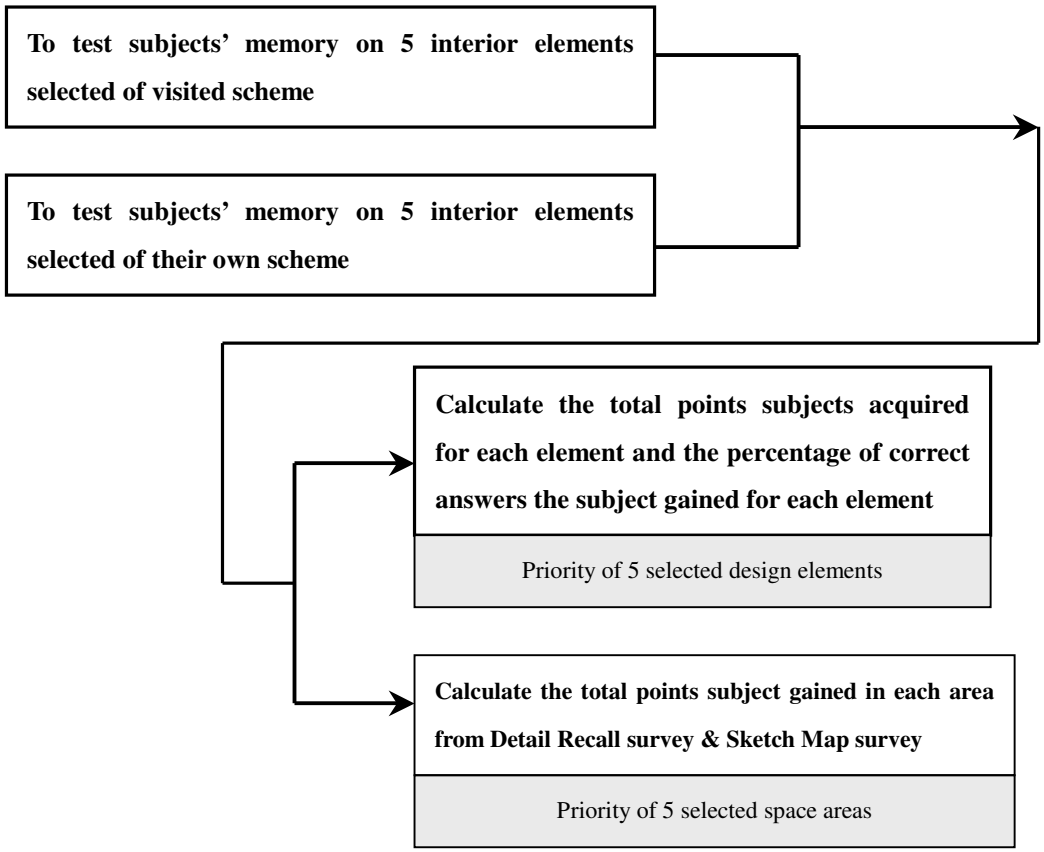


Figure 3.5. Outline of Detail Recall process.

The outline of this process is presented in figure 3.5. To initiate the research, a questionnaire *(see appendix Ⅲ- I)* was designed to test the subjects' memory on the details of different design elements within five selected areas[24]. Though there were only five selected elements[25] available to be tested in this experiment, it was deemed that the "size of room" would be difficult to evaluate and "layout of space" and "space arrangement" would be better served by using the Sketch Map survey. Therefore, in this experiment, there were twenty-five questions in total regarding the five selected spaces within the scheme. Questions asked were only related to five selected elements i.e. colour scheme, decoration, lighting, furniture/equipment and flooring. The questions

[24] Entrance area, common room, common kitchen, laundry and common shower room.
[25] Colour scheme, furniture/equipment, lighting, decoration and flooring.

were as follows. On the colour scheme, the participants were asked if they were able to recall the colour of the paint used on the walls of the five selected areas. Regarding the decoration, the researcher asked the participants to provide two examples of decorative objects in the area or asked them if they remembered the type of the curtain used for the window etc. and which type of lighting was used in these areas. Questions relating to furniture and equipment issues were posed to ask the participants if they were able recall the type of seating or equipment in the selected areas. Finally they were asked what type of flooring was used.

In addition, to achieve more accurate results and to avoid the bias that participants would be able see their own living space, while carrying out the recall survey, subjects were taken to another scheme and were asked to recall their own scheme. Finally, the subjects were taken back to their own scheme and asked to repeat the same procedure to recall the detail of the visited one. The Detail Recall survey was utilised in order to determine elderly person's general awareness of selected spatial areas. More precisely, it was employed to discover the research subjects' awareness of the selected design elements.

- **Detail Recall analysis method**

To translate this information into statistical data, a points system was adopted to calculate the results achieved by each subject. For instance: subjects were allocated one point for each correctly answered question. Furthermore, the total results from each subject were put together into Excel for statistical analysis, in order to calculate the total correct answers for each individual element. This data was then taken as identifying the

priority of the design elements which particularly caught the subject's attention within the scheme. The details of these findings are set out in chapter 4.6.

3.4 User-centred conversational tour (UCCT)

Within analytical environmental research, interviews or questionnaires are commonly used in order to evaluate the participants' response to spatial design. However, as those methods require participants to imagine or recall their memories about the space, in order to provide answers or feedback, it could be argued that their responses might be too variable. In some cases it is possible that what people say is not what they actually think (Yin 1994). It is often assumed that elderly people, in general, are more inclined to want to please people and may only say what they expect researchers want to hear. If this is the case, it could be argued, that even with a large number of respondents the results obtained could prove unreliable.

Moreover, there are inherent weaknesses with the process of interview. The researcher may place their own particular bias on the design of specific questions or they may be just poorly constructed, ultimately leading to a poor response (Yin 1994). In answer to this, some social researchers asked subjects to produce their own video diary with their own narrative to explain their feeling about the environment (Rich et al 2000). However, analysis of this data is time consuming and participant's skills in taking photos or video may adversely affect the results of the research. Therefore, in order to make the research as unbiased an approach as possible, Millar (2006) used the "Conversational Tour", in which participants are actually taken to the place of research and encouraged to explain themselves and express their feelings about this environment in context. By adopting this method any bias may be overcome or at least the most unbiased approach possible can be achieved.

For these reasons, the method in this study was developed further by asking

participants to give feedback in real settings, with the goal of obtaining a more direct response. In addition, the visual and narrative information was recorded via mini digital camcorders to provide specific evidence. Furthermore, a quantitative approach was employed to analyse the data

3.4.1 Protocol

The principal aims of the User-centred conversational tour were to discover elderly peoples' perceptions toward sheltered housing design as well as their level of satisfaction. Indeed, the implications of this are that they may assist in effective improvements for this type of accommodation. In order to achieve the aims of the conversational tour the objectives were:

(1) To carry out the survey by asking participants to give feedback on selected spatial areas in the real site and also record the narrative and visual information by using a digital video camera.

(2) To translate the verbal information into textual information.

(3) To code (derive categories from) information with five selected design elements[26] and divide into positive and negative information. (see appendix Ⅲ-Ⅱ for protocol of coding participants' verbal information)

(4) To find out the level of satisfaction with each individual selected design elements and spatial areas.

(5) To determine a set of design issues in each area and to relate these to key interior elements.

[26] Colour scheme, furniture/equipment, lighting, decoration and flooring.

(6) To form a design checklist by summarising the design issues and forming conclusions.

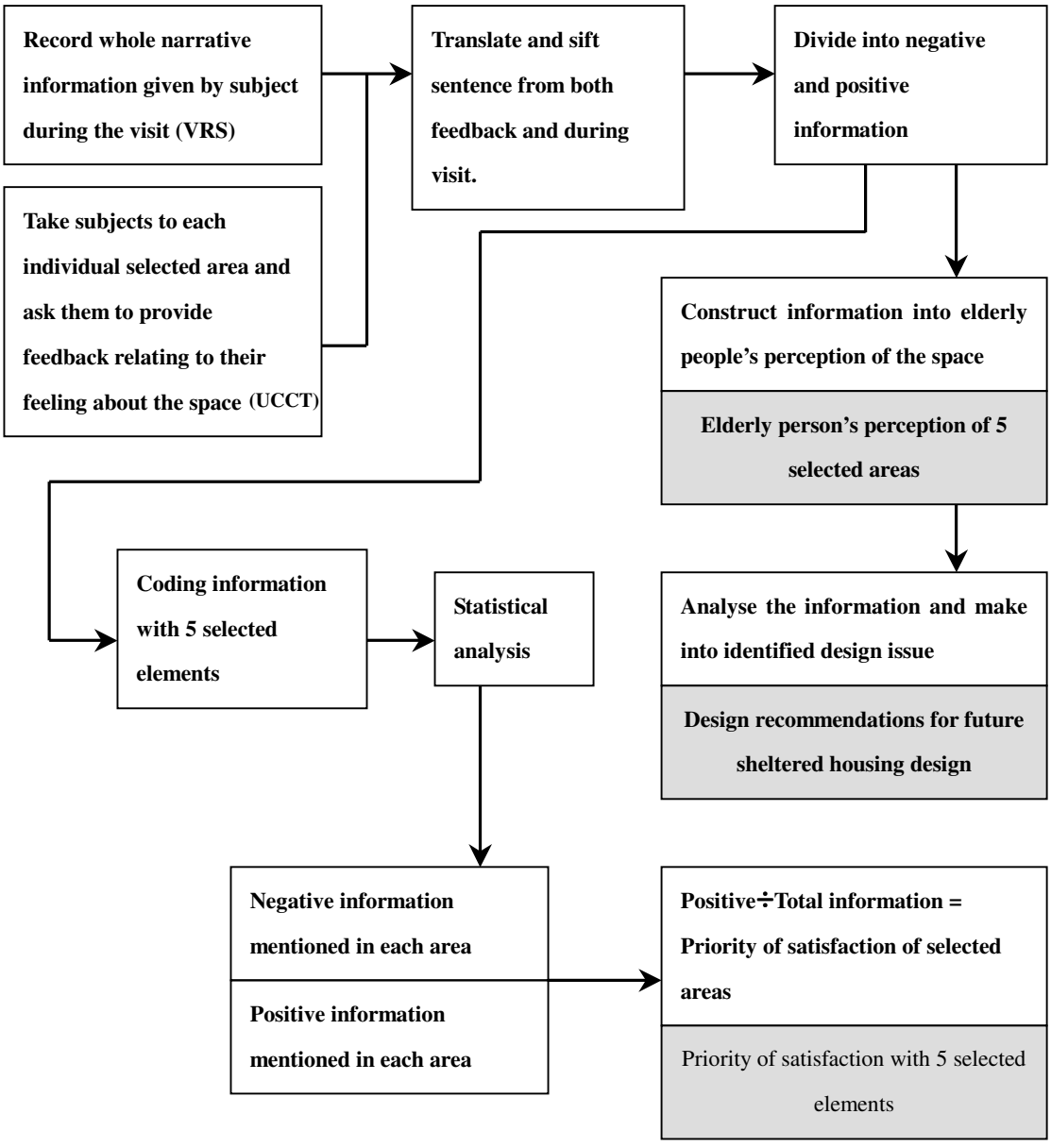


Figure 3.6. Outline of Use-centred Conversational Tour process.

In order to obtain in-depth information on the participants' perceptions toward sheltered housing design, instead of using direct methods such as a questionnaire or interview, participants were assigned to each of the selected areas and asked to give feedback relating to their feelings about the design of the individual area. The visual and audio narratives of this were recorded via digital camcorders for further analysis. The research process is illustrated in figure 3.6. (P.124)

- **User-centred Conversational Tour analysis method**

There are two stages for analysing the recorded narrative information. The first is to extract and translate the information into a qualitative result to determine the participants' perception of the selected spatial areas. The second refers to the quantitative results on the participants' level of satisfaction. Details of information analysis process are presented below:

Review and transcription

Narrative information from the eight subjects was transcribed into text for further examination.

Translation / Simplification

The narrative information contains a large amount of data, which might not be directly related to this research. Therefore, to clarify the issues arising from the narrative information, the transcribed data from the eight subjects was translated and simplified according to the design issues related to this project. Finally, these were classified according to the five selected spatial areas within the sheltered house scheme.

Classification

The design issues identified within the five selected spatial areas were classified into "negative opinion" (or suggestions on improvement) or "positive opinion". The data obtained at this stage was summarised as qualitative results for the subjects' perceptions and preferences regarding spatial design issues (*appendix Ⅳ- Ⅴ)*. These issues were then related to the key interior elements and, thereby, formed a design checklist (see chapter 4.7.3.2 and *appendix Ⅲ- Ⅲ*).

Furthermore, to convert this to quantitative data, each original piece of narrative

Initial dialogue/descriptions	Code	Identification of design issue
Common room	**Total number of elements mentioned: 1A, 1B, 1D, 1E, 1F, 1G**	
➢ **The lounge is spacious, it is a well lit area. Personally I think it is well laid out.** ➢ **"There is nothing homely about it, no personal touches in there. There is a lot of stuff in our place that people have put in there themselves."** ➢ **The magnifier is excellent.**	**A,B,E,G** **D** **F**	➢ **A good lighting scheme including artificial and natural light is essential for the elderly resident.** ➢ **Chairs situated along the perimeter of the room make the area feel more spacious.** ➢ **Personal touch or decoration in the common area can make the place feel more homely.** ➢ **Facilities such as magnifiers will enhance residents' use of the common room, particularly those with sight impairment.**

Categories of Design Elements:

A: Room Size	E: Lighting
B: Lay out of space	F: Furniture/equipment
C: Colour	G: Space arrangement (furniture/equipment arrangement)
D: Decoration (other than paint)	H: Flooring

Table 3.1. Example of Subjects' initial description coded and make into their preferences of the Space and Perceptions of space design

information was coded with eight related design elements to identify the elderly subject's level of satisfaction with the selected design elements. Accordingly, an example of how the subjects' initial descriptions were coded and transferred into their

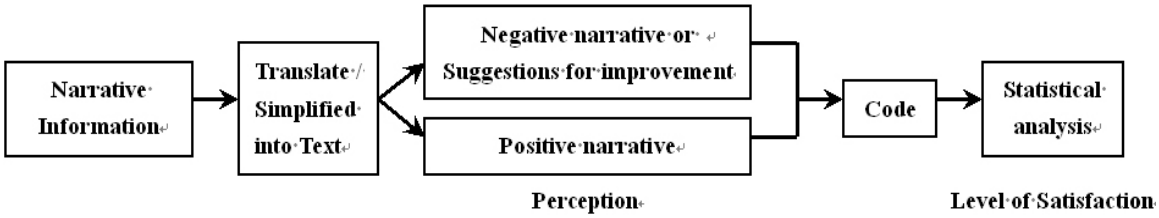


Figure. 3.7 Outline of analysis process for User-centred Conversational Tour

preferences and perceptions, of the current spatial design, is provided in table 3.1. (P.126) From the example, one of the subjects described the common room as follows: *"There is nothing homely about it, no personal touches in there. There is a lot of stuff in our place that people have put in there themselves."* Consequently, as the issue the subject raised is related to the "Decoration" of the space, it was coded with one "D". The total amount of narrative information, related to the selected elements and spatial areas, was then input into Excel for data analysis to achieve a clear result. The process of this is set out in figure 3.7 with the findings being presented in sections 4.7.3.1 and 4.7.3.2.

3.5 Conclusion

This section has highlighted the background related to each of the four methodologies used in this study as data collection methods. Essentially, this has been carried out by reviewing the relevant spatial research related to people's perception of space areas. The literature review indicated that methodologies used to determine people's perception of environment and extract people's environmental cognitive information, are varied. However, most of these methods involve direct contact with the subject to achieve their aims. Also apparent from this review, it could be argued, is that an individual's attitude toward the research topic might have a significant influence on his/her responses to any questions asked. Moreover, most previous research methods have been focused on large-scale environments such as cities or towns and only rely on single evidence.

Most importantly, this chapter has highlighted the protocol of four different

Method & Aims	Priority (awareness) of the selected spatial areas	Priority (awareness) of the selected design elements	Perception of the selected spatial areas
Visual Record (VR)	√		△Part of*
Detail Recall (DR)	Results combined together	√	
Sketch Map (SM)	√	△Part of**	√
User-centred Conversational Tour			√

*** Based on visiting behaviour observed**

****On layout, space arrangement and furniture/equipment only**

Table 3.2. Methods used with it aims

methods, which include: aims and objectives of each method, data collection and technique for analysing the findings. The aims of each method used are presented in table 3.2. (P.128).

In order to analyse the results, both qualitative and quantitative methods were employed to examine the raw data gathered from the various methods and, therefore, yield as much information from them as possible. While the quantitative data provides a general understanding of the participant's awareness of the selected interior spatial area, the qualitative information presents the more detailed evidence to support the findings and reveals extra information on the participant's perception of each individual space. For instance: Quantitative data from the Visual Record and Memory Recall were used to gather the participant's awareness of the selected spatial areas and interior design elements. Moreover, the qualitative data from the Visual Record was used to support the findings from the quantitative data.

The results acquired from each method used are presented in chapter 4 and the comparisons and relations between methods and their findings are discussed in chapter 6.

CHAPTER 4.

MULTI-METHOD APPROACH

4.1 Introduction

The research hypothesis, based on previous literature, is that the application of an indirect method of acquiring data from the elderly, compared with the use of direct method, would greatly improve results. In particular, the adoption of this multi-method approach would assist in cross checking results and enable more accurate understanding of the subjects' thinking. Therefore, the research aims were centred on an appreciation of elderly persons' perceptions and their awareness of a spatial design environment and particular elements therein. The research methods included in this study were: Visual Record survey (VRS), Memory Recall survey (MRS) (comprising Sketch Map and Detail Recall methods) and User-centred Conversational Tour (UCCT) method.

The research process was divided into three phases (Table. 4.1): First: Visual record cross-site examination. Second: Memory Recall survey and, finally, User-centred conversational Tour. Moreover, taking into consideration the participant's age and their physical strength, the processes were carried out on three different days. This was, primarily, to ensure they were in the best condition to carry out the survey and, therefore, to facilitate a more reliable response.

Research schedule	**Day 1**	**Day 2**	**Day 3**
Methods used	**Visual Record**	**Memory Recall 2***	**User-centred Conversational Tour**
	Memory Recall 1*		

Memory Recall 1*: Memory recall for the subjects' own scheme.

Memory Recall 2*: Memory recall for the visited scheme.

(Memory Recall method: Comprising Sketch Map and Detail Recall survey)

Table. 4.1 Schedule of research process.

There are eight sections in this chapter. Section 4.2 explains how the interviewees were selected and the research preparation carried out. Section 4.3 sets out the ethical issues that need to be addressed and explains the author's approach to protecting the confidentiality of the elderly participants. Section 4.4 describes the selected sheltered housing scheme on which the practical research was based. Section 4.5 outlines the methods used to determine the elderly participants' awareness of the selected spatial areas, which include the Visual Record and Memory Recall survey. Section 4.6 describes the Detail Recall survey (part of the Memory Recall survey) adopted to reveal their awareness of the selected design elements. Section 4.7 explains the methods for gathering perceptions of sheltered housing from the elderly participants, which include the Sketch Map survey (part of the Memory Recall Method) and User-centred conversational Tour. Each of these sections sets out the details of the particular method used within research protocols, followed by data analysis and, finally, the individual research findings. An overall summary is provided in section 4.8. In order to fully evaluate the methods used in this study, a questionnaire was conducted with the participation of twenty-four elderly people, as well as subsequent interviews with nine design-related professionals. The details of the related data analysis and results are set out in chapter 5. Furthermore, a more detailed discussion of the methods employed and both their inter and intra relations are presented in chapter 6.

4.2 Participants selection and research preparation

Due to cost constraints, all of the information was collected in Leicester. With a population of 280,000, Leicester is one of the largest cities in the East Midlands and the tenth largest in the country. It may be seen, therefore, that Leicester is representative of many English cities. In Leicester, there are approximately 162 sheltered housing schemes for older people (Housing Care organisation 2006) mainly provided by the local authorities, housing associations and private sectors. The Leicester city council Housing Department has been a direct provider of sheltered housing since the late 1960's. They state that "the Service is responsible for the provision of safe, secure, easily managed accommodation for older and vulnerable people, with additional support provided by Sheltered Housing staff" (Leicester City Council Sheltered Housing Department 2005). The council are currently responsible for 398 units within 14 schemes, comprising a mixture of studio flats (262) with lounge/kitchen and bedroom combined in one space and one-bedroom flats (136) which provide a separate bedroom. Evidently, the council are one of the biggest providers of sheltered housing in the Leicester city area, most of which were purpose-built by the local authority.

Most sheltered housing schemes have an average of 30 flats per building. These housing schemes have public open spaces comprising: common room with kitchen, laundry, common shower room and garden. Residents have their own private flat, each with their own living room, bedroom, bathroom, kitchen, and hall area. These represent the typical standard of the sheltered housing schemes available for an affordable rental. Additionally, as the protocol of the sheltered housing scheme states (Leicester City Council Sheltered Housing Department 2005), the resident must be at least 60 years of age or over without mental disorder and able to manage their own daily activities. Thus,

as the research was intended to measure the subjective experience of spatial environment, this protocol effectively filtered out unwanted bias, for example: people with dementia or mental disorder etc. As a result, the ideal candidates chosen for this study were elderly residents from Leicester City Council housing schemes.

Because of the ethical and privacy issues involved in selecting the participants, the author sought the assistance of the Leicester City Council Housing Department. A meeting with department managers was arranged and a research project information statement was produced *(see appendix Ⅳ- I)*, in order to explain the aims and procedures of the project. The Department itself showed a high degree of interest in the research proposal and helped to send out the survey invitations to their tenants. This resulted in nine participants, willing to help with the study, being randomly sampled from fifteen different sheltered housing schemes. However, one of them was unable to complete the study because of a health issue. Therefore, the selected eight participants remaining comprised: three males and five females with an average age of 74 years and living in 5 different sheltered house schemes (Table 4.2, P.135).

Moreover, a number of studies have found that the process of entry to residential care and the change in environment can result in a deleterious effect on elderly people (Blenkner, 1967, Wittels and Botwinick, 1974). However, this is usually because they can manage better and make fewer mistakes in their familiar surroundings (Windmill 1990). Indeed, similar research by Rodstein et al (1976) suggests that the majority of elderly people will have adjusted to residential care after a period of six months. Therefore, even though Rodstein's research was focused on a care home environment, the inclusion of residents from sheltered housing may yield similar results. It could also be argued that these residents may adjust to their surroundings in a much quicker period,

as they are more active and independent. Accordingly, to avoid any bias in this study, the selected participants have lived for an average length of six years in sheltered housing and have at least been residing in sheltered housing for more than three and half years.

	Age	Occupation before retirement	Length of stay in the scheme (Years)
Alan	**77**	**Engineer**	**5**
Patricia	**68**	**Dinner Lady**	**5**
Susanne	**69**	**Sheltered house officer**	**8**
Joyce	**79**	**A. Home help**	**15**
Pops	**75**	**Engineer**	**5**
Yvonne	**76**	**Nurse & midwife**	**3.5**
James	**81**	**Engineer**	**10**
Norma	**77**	**B. Clerical Worker**	**10**

Table. 4.2 Background details of eight participants.

Furthermore, as the sheltered housing scheme developments are intended for the active elderly, i.e. those who maintain a high degree of independence and are able to manage their own housework, all participants reported being in good health. There was no history of primary degenerative brain disorders, strokes or other serious circulatory problems, or any other serious medical condition. None of the participants were taking psychotropic medications and all were able to get around independently. Only two of

the participants require a wheelchair or motorised scooter for long distances.

In order to ensure an efficient research process, each participant was met by the author prior to the actual research commencing. This involved introducing the participant to the details of the research process, covering issues including: the purpose of the research, the proposed meeting date and time, transport required during the research and the reason for seeking their input. However, as the research methodology employed was intended to highlight the participant's perception and feedback about the spatial design, the researcher did not explain the aim of each methodology used in detail and only gave them instructions about the process. Therefore, the participants were only made aware of the main aim of the study and what they, individually, needed to do. They were not provided with the reasons behind each method used and how the data would be analysed. This approach, then, would help to facilitate a more natural response from the participants.

Additionally, a simple questionnaire (*see appendix Ⅳ-Ⅱ)* was used to ask all participants to provide their personal details including: age, occupational background and length of stay in their present scheme etc. The methodical collection of personal profiles can be of significant value for all sorts of reasons. Most importantly, perhaps, is that it can demonstrate to what extent participants represent a cross-section of the community.

Moreover, research by West et al. (2002) suggests that testing at various times of day can be responsible for accentuating age differences. For instance, it is older adults who are seen as more active and relatively more alert in the morning. Thus, taking into consideration the participant's age and physical strength and ensuring that they were in the best condition, the whole survey was conducted in the morning. In addition, the

participants were asked to select the date of the survey that would best suit them.

Furthermore, detailed photos and videos of the interior environment, in each sheltered housing scheme, were taken during the first visit and recorded as reference for the future research.

4.3 Ethical issues

By embarking on a study such as this, the author inevitably faces important ethical issues, especially as it involves the participation of elderly people. Therefore, in this study the guidelines on ethical approval for research involving human participants, from De Montfort (2004), have been consulted and addressed. Further approval was granted by the De Montfort University Human Research Ethics Committee.

All proposed methods involved with communication and human participation were conducted in a professional manner by adhering to the ethics interview guideline, proposed by Gillham (2005), with care and respect afforded to all individuals concerned. The elderly people involved in this project were residents from the selected Leicester city council sheltered housing schemes. This was within the supervision of the Leicester housing department, who also gave their approval for the research to be carried out.

In order to achieve effective cooperation with the elderly participants, the researcher requested their permission, to take part, through formal documents before the research commenced. Each participant was then presented with an introduction to and outline of the research. The importance of providing this information prior to the research process is that established guidelines suggest researchers should impart as much information as possible about the potential research so that the prospective participants can make an informed decision about their possible involvement (Gillham 2005). If the participants chose to withdraw from this study at any time and for any reason, they would not be used in the analysis unless removal of the data was not logistically possible.

Additionally, participants were informed of their rights under the relevant copyright and data protection laws. In particular, they were informed that all the audio

and video data recorded for this research will be kept strictly confidential by the author. All the required permits were gained, also, from each individual subject to be used in this thesis. The schedule of the research process, including all the interview time tables and visits, were then proposed to the Leicester Housing Department at the beginning of the research. Subsequently, a note was posted to the selected sheltered housing schemes, a few weeks before the visit, in order to inform the residents about the research and the possible effects this would have on their normal routine. Furthermore, to maintain the anonymity of the participants and to offer confidentiality to all those involved, the researcher himself has carried out all transcription work. In order to avoid leaking any of the participant's personal information during the transcription, only the participants' first names have been displayed as preferred by all those involved in the research. The photographs displayed within this thesis were carefully selected in order to avoid revealing any participant's identity. Indeed, only one participant's face actually appears in the thesis to demonstrate the Visual Witness glasses (VW glasses, Figure 3.2, p.112), used in the Visual Record survey. Most importantly, this was included with the permission of the participant. Thus, the results of the study, published or unpublished, will in no way identify any of the participants.

Furthermore, it is important to state that during the research, the personal data, tape/photographs/video recordings and transcripts will be stored in a locked desk in the researcher's home. Other than the researcher, only the supervisors will have access to the raw data. Additionally, data will be held for the period of the research and will be destroyed after 3 years following the research by shredding, erasing tapes and deleting electronic files.

4.4 Research Site selection

4.4.1 Introduction

What constitutes sheltered housing incorporates various types of buildings. They may be the Modern luxury flat, conversions from Victorian buildings or bungalows etc. However, the most common schemes usually consist of between 20 and 40 individual units which usually contain both bedsitters and one bedroom flats. The typical one-bedroom flats usually comprise, one bedroom, living room, a kitchen, bathroom and a small hall area near the entrance. A bed-sitter is generally smaller, the accommodation comprising: a kitchen, bathroom, and bedroom-cum-living room. The communal areas include: laundry, common shower room and communal lounge areas. Some buildings have provision for two communal lounges, one of which is, invariably, utilised as a communal library. There are a number of schemes with a guest bedroom, which can be rented out, if family or friends wish to visit the elderly resident. For the purposes of this research, there were six different sheltered housing buildings chosen, details of which are described below.

4.4.2 Bob Trewick House

Bob Trewick House (figure 4.1) is a Grade II listed building very close to Leicester city centre. It is a three-storey complex combining two buildings, which are accessed through two separate entrances. The layout of the building is a "T" shape with narrow corridors. The front

Figure. 4.1 Bob Trewick House

elevation faces out to De Montfort Square, revealing an attractive open space with seating areas provided. The view from the rear side of the building reveals a railway line and car park. Its current status as a sheltered house has been maintained for approximately twenty years. Shops are situated close by and there are several bus routes convenient for access to locations outside the city.

The building comprises twenty-four flats in total, including fifteen one-bedroom flats and nine studio flats. On the ground floor, there are studio flats, a common shower room and communal laundry with a lift and stairs to the upper floors. Also, a furnished guest bedroom is available for tenants' short-stay visitors. Two common rooms (Figure 4.2) are situated on the first floor adjacent to each other with a fully equipped kitchen situated in between. This provision of two separate common rooms effectively allows for more options for use. Different groups utilising these spaces for different activities can therefore be readily accommodated. It also allows some choice, if residents wish to

Figure. 4.2 Bob Trewick House: (Left) small common room, (Right) big common room.

have a quiet space. A small office is also located on this floor for use by the sheltered housing officer. The second floor consists mainly of one-bedroom flats and one refuse room. In addition, each floor has been painted with its own distinct colour to assist visually impaired residents in identifying which floor they are on.

4.4.3 Cromwell House

Cromwell House is a two storey building with "U" shape layout and located on Saffron Lane in the south of the city centre. Shops, hairdressers, a hardware store and library are within walking distance and a leisure centre is only two minutes away. There are bus services convenient for both the city centre and outside locations. The building has ten one-bedroom flats and twenty studio flats. The ground floor is mainly comprised of studio flats. Communal spaces include one common room lounge (Figure 4.3) facing a communal garden. In addition there is a fully-equipped kitchen and laundry. One small office is also located on the ground floor near the entrance area. At the opposite end of the building there is the provision of a refuse and recycling room. On the first floor, there are one-bedroom flats and the provision of one common shower room. As this building has much wider corridors than the other selected schemes, some have been utilised as rest areas (Figure 4.4) and provide seating areas for residents to appreciate the views outside the windows. In addition, a furnished guest bedroom is available to tenants' short-stay visitors for a small nightly charge.

Figure. 4.3 Cromwell House: common room

Figure. 4.4 Cromwell House: first floor corridor

4.4.4 Frederick Jackson House

Frederick Jackson House is a two storey building with an "L" shaped layout. Each floor has two levels: lower ground floor and upper ground floor, lower first floor and upper first floor. Frederick Jackson House is situated in the West End of the city, and benefits from the services of a local greengrocer, butcher, baker, doctor's surgery, churches and a pub. The location of convenient public transport provides a five minute bus ride into the city centre.

This scheme has eight one-bedroom flats and twenty studio flats. Situated on the lower ground floor are a number of studio flats with a communal furnished lounge (Figure 4.5) provided with kitchen as well as a fully equipped laundry (Figure 4.5). In addition there is a stair lift near the entrance to help assist residents with physical difficulties and a walk-in lift to the first floor. On the upper ground floor, there are

Figure. 4.5 Frederick Jackson House: Common room (Left); Laundry (Right)

one-bedroom flats. An office and one furnished guest bedroom for tenant's visitors are situated on the lower first floor. A communal walk-in shower is also situated on this floor. The upper first floor consists mainly of studio flats.

4.4.5 John Minto House

John Minto House is a two storey building with a "U" shaped layout built around a communal garden. It is located in the North West of Leicester city centre and close to shops, doctor's surgeries, places of worship and public houses. Buses to the city centre are only five minutes from the House. The house comprises eleven one-bedroom flats and twenty-four studio flats. On the ground floor there are two communal furnished lounges (Figure 4.6) with one being also utilised as a library. One lounge also incorporates a fully-equipped kitchen for residents to make afternoon tea. The ground floor also has a laundry and an adapted disabled toilet. A walk-in lift is located in the

Figure. 4.6 John Minto House: Big common room (Left); Small Common room (Right).

centre of the building and provides access to all floors. On the first floor there are mix of one-bedroom flats and bedsitters, a sheltered housing officer's office and a common shower room. There is also the provision of a furnished guest bedroom for tenants' short-stay visitors.

4.4.6 Norfolk House

Norfolk House is a two storey building constructed to an "L" shaped plan with a first floor comprised of two levels: an upper first floor and lower first floor. It is situated in the West End of Leicester, with a relatively short bus ride from the city centre. The immediate area is served by a number of local amenities including: shops, a Post Office, doctor's surgery, chemist and opticians, all within walking distance. The house incorporates nine one-bedroom flats and nineteen studio flats. Ground floor communal space includes: a communal furnished lounge (figure 4.7) with kitchen, a fully equipped laundry and an adapted disabled toilet. Spaces on the first floor include a shower room, office, and a furnished guest bedroom for tenants' short-stay visitors.

Figure. 4.7 Norfolk House: common room

4.4.7 Rupert House

Rupert House is a two storey building located in the Eyres Monsell estate, south Leicester. It benefits from numerous convenient local amenities such as a supermarket, post office, chemist, newsagent and public house. There are several bus routes nearby providing access to local shopping areas and the city centre. A health centre and churches are only a short bus ride away.

Figure. 4.8 Rupert House: Communal patio (Left); small common room (Right)

This house comprises 11 one-bedroom flats and twenty-four studio flats and a communal patio (Figure 4.8.). On the ground floor, there are two common rooms. The small common room is primarily used as a library (Figure 4.8), and the larger one is served by a common kitchen. The ground floor also has a fully equipped laundry, refuse room and two storage rooms. An adapted disabled toilet is also conveniently situated on this floor. A walk-in lift is situated at the back of the building, serving all floors of the property. On the first floor there is a common shower room, one furnished guest bedroom, a refuse room and one storage room.

4.5 Awareness of selected spatial areas

4.5.1 Introduction

In this research there were two distinct methodologies applied to determine elderly persons' awareness of spatial area: Visual Record survey (VRS) and Memory Recall survey. The Memory Recall method is divided into two sub-methods i.e. Sketch Map survey (SMS) and Detail Recall survey (DRS).

Research in environmental consumer behaviour suggests that familiarity with an environment could affect a person's perceptions and attitudes towards it because they are likely to process information differently within a familiar environment (Sirgy et al. 2000). For example, people with high prior knowledge tended to exert more effort in acquiring new information. Therefore, to avoid bias in the Visual Record survey, participants were taken to an unfamiliar sheltered housing scheme to conduct the survey. Following this, the Sketch Map survey and Detail Recall survey were carried out at the same site. As previously seen, the details of each method used within the research process were provided in chapter 3. A brief introduction and analysis of these methods are outlined below along with the findings of the research.

4.5.2 Visual Record survey (VRS)

The aims of this method were to achieve an understanding of how the elderly subjects explore an unfamiliar space and to make observations of any special behaviour they exhibit during the visit. For example, viewing or making contact with any

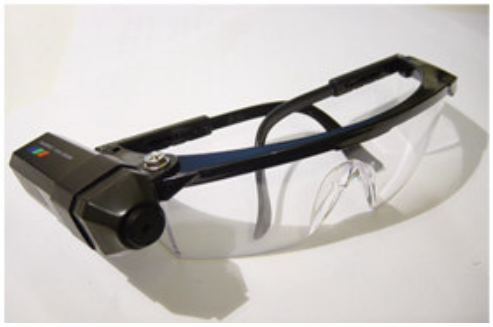


Figure. 4.9 Visual Witness glasses (VW glasses)

particular elements within the space. In order to achieve these aims, the research required participants to visit a completely unfamiliar sheltered housing scheme and provided them with specially designed Visual Witness glasses (Figure 4.9, P.147) to be worn during the visit (see chapter 3 for the specific details of the Visual Witness glasses equipment). With this apparatus in place the whole process of what the participants view could effectively be recorded, without inaccuracy, during their visit to the unfamiliar scheme. Also, in order to record the participant's speech, during the visit process, a digital voice recorder was employed.

In addition, to acquire more reliable data, before commencement of the tour, an introduction of the procedure was provided. Each participant was asked to assess the site while imagining that they were looking for a new accommodation to move into. They were allowed to spend as much time as they needed to look around the building space, particularly in those areas that they were most interested in.

4.5.2.1 Data analysis

(1) Average time subjects spent on each area

Since the subjects were wearing the video recording device throughout the duration of the visit, the video record effectively contains real-time visual output from the subjects. Each video was reviewed by using "Ulead Video studio 6" software to calculate how long each subject spent in each of the five different identified areas. However, as the research was only focused on interior space, the time each subject observed on the exterior of building was excluded from the total visit time. Subsequently, the results from each subject were put together into Excel to calculate the average time and percentage of total time the subjects spent visiting each identified area.

(2) Similarity on how the subjects observe/inspect space

To identify similarities in the manner in which subjects observe space, the author reviewed the recorded videos. Notes were taken during the review, to record individual behaviours or actions by each participant during the visit, including: the position of eye level, and direction. Moreover, the video footage of the visited routes, followed by the individual subjects, was reviewed and notes were taken to assist further analysis.

4.5.2.2 Findings

(1) Priority of selected spatial areas

Regarding the results analysis, Table 4.3. shows the percentages of total time each subject spent in the 5 selected areas and the average results from all 8 subjects. The

	Alan	Patricia	Susanne	Joyce	Pops	Yvonne	James	Norma	Percentage of total time subjects spent on each area
Entrance Area	4.92%	4.44%	13.27%	0.52%	3.77%	10.43%	4.83%	5.29%	5.934%
Common room	11.14%	9.56%	13.27%	8.92%	9.36%	11.04%	18.49%	22.25%	13.004%
Common kitchen	2.85%	2.05%	2.59%	0.00%	3.25%	2.15%	2.87%	1.54%	2.471%
Laundry	3.89%	4.27%	4.21%	5.25%	6.89%	2.45%	3.59%	3.30%	4.231%
Common shower	1.04%	0.85%	0.00%	7.87%	1.43%	0.00%	3.05%	5.51%	2.469%

Table. 4.3 Result from Visual Record Survey. (Time spent in selected spatial areas)

result demonstrates that, on average, subjects spent more time looking at the common room than the building entrance area, laundry and common kitchen. The least time was spent in the shower room while visiting the unfamiliar scheme. Furthermore, the results indicate a large difference between the time each subject spent in the common room and entrance area, but a negligible difference between common kitchen and common shower room.

When exposed to an unfamiliar building environment, particularly when seeking

accommodation to move into, people tend to spend more time in those spaces that they are most interested in. Therefore, the result suggests that the elderly participants paid more attention to the common room rather than entrance area or laundry. Less attention was reserved for the common kitchen and shower room. To support the findings and avoid bias, each video recorded, during the visit from eight subjects, was reviewed in detail, paying particular attention to their behaviour and attitude. The key findings from the video, in each selected area, are analysed below:

- **Common room lounge:**

Compared with the other selected spatial areas, subjects paid more attention to the details of the common lounge as they moved more slowly, continuously looking around this space. The video record reveals that the subjects mainly scanned the space at eye level, focusing on furniture and equipment within the space. It was observed, also, that some of the subjects approached and touched these objects. Special equipment such as magnifiers for the visually impaired person or unusual lighting were particular points of focus for the subjects.

Moreover, it appears, some of the subjects were very interested in decorative objects in the room. For example, items such as: cups, dolls on the shelf, pictures hanging on the wall, books on the shelf etc. were particularly favoured by the female subjects.

Furthermore, the video record shows that most subjects moved around the common room space making a fully comprehensive exploration of the environment. Most subjects looked out the windows and went outside to explore the external environment. This may indicate that the relationship between interior and exterior environment plays

an important role in the elderly people's perception of space.

■ **Entrance area:**

From the video recording, it was observed that most subjects walked through the area at an average walking pace and continually looked around the space as they proceeded. However, most of the schemes chosen did not have specific entrance areas and only a linking area between spaces. Most subjects paid more attention to the detailed decoration or facilities such as the type of main door, pictures on the wall, equipment such as stair lifts and building plan drawings etc.

■ **Laundry:**

The results indicate that most subjects, when entering the laundry, viewed the entire space in some detail. It appeared that particular attention was paid to the facilities and equipment such as, washing machines and dryers etc.

■ **Common Kitchen:**

Most subjects, it was observed, stood close to the door while scanning the whole space up and down. However, this may be due to the comparatively small size of the kitchen and the fact that it is the smallest of all the 5 selected areas. Moreover, the video evidence shows that participants were focused on facilities or equipment such as cooker, microwave etc. and contents of the cabinet, as some were recorded touching the equipment or opening the cabinet.

■ **Common shower room:**

The video record reveals that most subjects took a brief look around the room and, almost immediately, left the space. Two subjects, however, showed no interest in

entering this space.

■ **Other**

From the results, we find that most subjects were interested in and paid attention to the detail of the decoration while walking through the corridors. For example: the painting or pictures hanging on the wall etc. Additionally, 5 out of 8 subjects paid more attention to the notice board along the corridor and informed the researcher that they were looking for information on daily activities to compare with their own scheme.

Furthermore, during the visit, subjects spent an average of 8.13 % total visit time looking out the window and views of the garden, patio and outdoor facilities etc. Moreover, most subjects viewed the outside environment in more detail. The results demonstrate that the relation between the interior space and outdoor environment might play an important role for the elderly. The effective positioning of windows, relative to external views is, therefore, identified as a potential key design issue.

The findings from the video record of the visit provide good evidence to support the results amalgamated with the time subjects spent in each area. Together, they demonstrate that the elderly participants are more concerned with the design of the common room rather than other selected areas within the scheme and that the common kitchen and shower are less important to them. Consequently, when designing and planning a sheltered housing scheme, particular attention may need to be paid to the common room space.

(2) Visiting pattern

During the research, all the subjects were asked to commence their visit from the common room lounge or main entrance then to follow their preferred route. The results

reveal that all subjects walked around the building along the corridor and on to the next floor, then returned to the starting point. This result suggests that aged people are likely to adopt a methodical approach when walking around an unknown space, being guided by direction signs rather than randomly exploring the interior space in order to see the places they are most interested in. The only difference between subjects was in the actual time they spent in each area. A comparison and discussion concerning participants' visiting route is presented below.

The pattern followed by each participant through the common room was, in part, determined by the similarity of each spatial arrangement. In particular, as almost all the common rooms had chairs situated along the four sides of the room, the participants generally moved from side to side along the centre of the lounge. In relation to the entrance area, it can be seen that subjects tended to walk through the space without circling around. The route followed when subjects visited the communal laundry, was quite methodical. Most subjects entered this space and moved further into the room, if the space permitted them, and essentially used the same route to exit the space. With the common kitchen, most subjects only took a few steps into the kitchen and turned around and left without any further exploration of the space. The common shower rooms resulted in most of the subjects deciding to only stand in the doorway without actually entering this space. Moreover, the results demonstrate that many of the participants were keen to walk out and explore the exterior environment when they were faced with the various exit doors from the building.

4.5.3 Memory Recall survey (MRS)

Two distinct memory recall methods were adopted to determine the elderly participants' awareness of the selected interior spatial areas. These were Sketch map survey (SMS) and Detail Recall survey (DRS). Furthermore, the Sketch Map survey was also utilised to gain an understanding of elderly peoples' perceptions of the building environment. Details of the representation of space on the participants' perception are presented in section 4.7. In addition, in this study, the Detail Recall survey was also employed to discover the priority of selected interior elements, the details of which will be discussed in chapter 4.6.

4.5.3.1 Sketch Map survey (SMS)

The main aims of the Sketch Map survey were to test the subjects' memory of each selected spatial area, in order to understand their awareness of the space. These aims also took into consideration the individual's perception, through their drawn representation of the selected spatial areas. Therefore, in order to accomplish these aims, each subject was required to visit an unfamiliar sheltered housing scheme. While they were still situated in the visited scheme the subjects were then asked to produce drawings of five selected spatial areas of their own living scheme. Particular instructions were given by the researcher to the subjects. For instance, in order to ask the subjects to produce a drawing of the common room in their own scheme the instructions were:

> Could you please draw the "common room" of your own scheme with as many details as you can recall. This might include all the furniture with their space arrangement and layout of space, including doorways, windows etc.

The subjects were then asked, on the next day, to produce a second drawing of the visited scheme with the same instructions, while they were situated in their own scheme. Moreover, the subjects were allowed to use any drawing instrument that they required, and, also, were given as long as they needed in order to fully complete their drawing. It was also deemed important to accommodate those subjects that may prefer to use writing or narrative explanations while carrying out the drawing process. Hence, digital video was utilised to record this part of the survey. Drawings produced from the Sketch Map survey by individual participants are presented in *appendix Ⅳ-Ⅲ*.

In order to make a satisfactory and valid analysis of the findings, a comparison was made of each drawing with the actual building layout and photographs taken earlier to form the conclusions. Moreover, the results relating to the participants' perception of the five selected spatial areas are detailed in chapter 4.7

4.5.3.2 Detail Recall survey (DRS)

The Detail Recall survey was not only employed to obtain more information on elderly persons' awareness of selected spatial areas but, also, the selected design elements. In order to achieve this, a questionnaire *(see appendix Ⅲ- Ⅰ)* was developed to test the subject's detailed memory of interior elements within their own and visited sheltered housing schemes. There were 25 questions in total regarding the five selected spatial areas within the scheme. It is important to stress that this test was carried out in a different building in order to avoid the bias that might accrue with the participant's familiarity with the building. More importantly, this would help to restrict the participants from seeing the environment related to the test, while completing the recall survey. All the collected information was analysed by making comparisons of the

subjects' answers with the real site environment.

4.5.3.3 Data analysis

To reveal the elderly participants' awareness of selected spatial areas within the sheltered housing scheme, results gathered from the Sketch map survey and Detail Recall surveys were combined to produce an average result.

(1) Sketch Map Survey

In order to make the information gathered from the participant's Sketch Map clear, it was presented as statistical data, which could then be readily analysed. The assessment of the analysis of results was based on the assessor's first hand experience and understanding of the drawing plan. Drawings were ranked by the researcher and, also one architect experienced in spatial design planning.

To analyse these results, each drawing was divided into quarters and compared with reference to the real site plan and pictures. Subsequently, each drawing was analysed and scored by considering three main parts: "overall recognition of the space", "object recognition" and "the relation between objects". Detail on this method of analysis is presented in chapter 3.3.1. For overall recognition, the subjects were given one point for each quarter of the drawing displaying the correct object contained within the right layout. Four points were given if the information on the participant's drawing was totally correct. Similarly, with the object and relation recognition, the drawings were ranked on a scale of 1 to 4. Four points were given if the information on the participant's drawing was totally correct. Consequently, the total points from the two assessors on the two schemes were calculated and the average points the subjects

obtained, in each area, were derived. These results are set out in section 4.5.3.4. In addition, the drawing will be discussed within the qualitative assessment to explain their perceptions of the space in section 4.7.

(2) Detail Recall survey

To analyse the results of this survey, the answers provided by each subject were compared with the pictures or videos recorded earlier of each sheltered house scheme. A points (score) system was then adopted to calculate the results achieved by each subject. Thus, subjects were allocated one point for each correctly answered question. With this, the author was able to calculate the average number of correct answers given by subjects in relation to each individual selected element. The total results gained from each subject were put together into Excel for statistical analysis in order to find out the priority of the selected design elements within the scheme *(see appendix IV-IV).* The findings of the Detail Recall survey are presented in section 4.6. Additionally, the results relating to the number of correct answers, for each individual element, was analysed according to the five selected spatial areas to identify the priority of selected spatial areas.

Whereas the Sketch Map survey can determine the participant's recall on the "layout of space" and "spatial arrangement" of individual spatial area, the Detail Recall survey helps to identify which selected design elements the participants paid most attention to. Therefore, results from the Sketch Map and Detail Recall survey were combined to allow comparisons of the subjects' memory between different areas, thereby revealing which selected spatial areas participants paid particular attention to.

Consequently, the priority given by the elderly subjects to the selected areas, within the scheme, could be evaluated.

4.5.3.4 Findings

Table 4.4 shows the points each subject achieved from the Sketch Map survey (SMS) and Detail Recall (DRS) of each selected spatial area. After calculating the total points each subject gained from the survey, the average rankings on subjects' memory recall of the five selected spatial areas were: 1. entrance area (5.69 points) 2.common room (5.66 points) 3.laundry (4.47 points) 4.common kitchen (4.22 points) 5.common shower room (3.31 points). Results were interpreted as an indication of the perceived priority of spatial areas within the sheltered housing scheme.

Moreover, the results reveal, in the Sketch Map survey, subjects had greater recall of the common room than they had of the entrance area, more recall about the laundry

	Entrance area	Common room	Common room kitchen	Laundry	common shower room
Average points for subjects from SMS	1.50	2.16	1.41	1.47	1.00
priority	2	1	4	3	5
Average points for subjects from DRS	4.19	3.5	2.81	3	2.31
priority	1	2	4	3	5
Total points for subjects in each area	5.69	5.66	4.22	4.47	3.31
priority	1	2	4	3	5

Table 4.4. Results from Sketch Map and Detail Recall survey (priority of 5 selected spatial areas)

than the common room kitchen and less recall about the common shower room. The

Detail Recall survey presented the following results: 1. entrance area 2.common room 3.laundry 4.common kitchen 5.shower room.

In addition, the results demonstrate that most participants had a greater recollection of their own building, in terms of the spatial arrangement of each individual area, compared with that of the visited scheme.

Furthermore, the scores from subjects' recognition and recall of the "objects" within the space and their "relation of objects" (Table 4.5) given by the two assessors show that the overall points the subjects acquired in each selected area were: 1.common room (2.16) 2.entrance area (1.50) 3.laundry (1.47) 4.common kitchen (1.41) 5.common shower room (1.00). The result also reveals that the elderly participants had a better recollection of the "objects" in each individual area rather than in their relation to each other. In other words, they could readily recall the objects contained within each room,

	Entrance area	Common room	Common room kitchen	Laundry	common shower room
Overall points for subjects from SMS*	1.50	2.16	1.41	1.47	1.00
priority	2	1	4	3	5
Average points for subjects from objects*	1.56	2.53	1.47	1.88	1.16
priority	3	1	4	2	5
Average points for subjects from Relation*	1.31	2.34	1.22	1.38	1.09
priority	3	1	4	2	5

***Object: Recall on object**

***Relation: Recall on object's relation**

Figure. 4.5 Results from Sketch Map Survey

but were not sure where these were specifically located. Therefore, relating to the recall of objects in each individual area, the results indicate that participants remembered more objects in the common room, gaining an average score of 2.53 points (the full score is 4 points) than they could achieve with the laundry with an average score of 1.88 points. This was followed by entrance area with an average score of 1.56 points, common kitchen with average score of 1.47 points, then common shower room with average score of 1.16 points. Furthermore, this precedence of recall was replicated in the results on the recall of the relation of objects, with the following scores: 1.common room (2.34points) 2.laundry (1.38 points) 3.entrance area (1.31 points) 4.common kitchen (1.22points) 5.common shower room (1.09 points).

4.5.4 Conclusion

Essentially, this section has provided detail of the methodology used to identify the order of priority of the selected spatial areas, together with the research process and methods. It has presented an in-depth analysis of these elements and has revealed the research findings. Results acquired from the Visual Record survey afford an understanding of the process involved in elderly people's exploration of unfamiliar spaces. Furthermore, the VRS provides an identification of the subjects visiting behaviour and the similarities in how they observe and inspect space. It demonstrates that, on average, subjects spent more time looking at the common room than the building entrance area, laundry and common kitchen. The least time was spent in the shower room while visiting the unfamiliar scheme. A detailed review of this resulting data, supported by the video record, shows that the participants' behaviour and attitude provide evidence to support the hypothesis that people generally spend more time in the

space that they are interested in or those areas they feel are more important to them. For instance, during the visit to the common room lounge, subjects paid more attention to the details therein compared with other selected areas. More specifically, the video record reveals that the subjects moved more slowly and scanned the space at eye level, focusing on furniture and equipment within the space. However, whilst in the common shower room, most subjects took a brief look around and, almost immediately, left the space.

Furthermore, the results also demonstrate that the relationship between the interior space and outdoor environment, plays an important role for the elderly. Moreover, the effective positioning of windows, relative to external views is, therefore, identified as a potential key design issue. Additionally, the results concerning the elderly subjects' visiting pattern, suggests that aged people are more likely to adopt a methodical approach when walking around an unknown space, being guided by direction signs rather than randomly moving around the space, in order to see the place they are interested in

In regard to the Memory Recall survey (Sketch Map and Detail Recall), the results show that subjects had a greater recall of the "entrance area" than they had of the "common room", more recall about the "laundry" than the "common room kitchen" and less about the "common shower room". In addition, the scores acquired from the subjects' recognition and recall of the objects within the space and their relations, shows that elderly people have greater recollection of the objects in each individual area rather than their relation to each other.

The findings of the Detail Recall survey, reveal that subjects had a greater recall of the elements of detail in the entrance area, followed by the detail of the common room

and then details of the laundry and remembered less elements in the common kitchen and shower room areas. In addition, the results demonstrate that most participants had a greater recollection of their own building, in terms of the spatial arrangement of each individual area, compared with that of the visited scheme.

Finally, the results from the Memory Recall and Visual Record survey were very similar, with the only difference being the order of priority 1 and 2 (common room and entrance area). Through all these methods, it is clear that all subjects paid more attention to the common room lounge and entrance area and paid less attention to the common kitchen and common shower. The details of the findings, between these particular methods, are discussed in chapter 6.3.

Furthermore, the findings of this research could be utilised either by an organization or designer when planning a new accommodation for elderly people and to establish the budget balance between interior spaces.

4.6 Awareness of selected design elements

4.6.1 Detail Recall survey

In order to explore and reveal each participant's awareness of the selected design elements, the Detail Recall survey was adopted. Essentially, the aims of this survey were to identify the priority that the elderly subject's awareness of the selected design elements within the scheme. Details of the research process was presented in section 4.5.3.2 with the method of analysis described in 4.5.3.3

4.6.2 Findings

Table 4.6 displays the percentages of right answers (correlated to the actual environment) given by subjects on each design element. The average rankings on subjects' memory recall of the 5 selected elements were: 1.colour scheme (72.50%) 2.furniture/equipment (67.50%) 3.lighting (63.75%) 4.decoration (56.25%) 5.flooring (52.50%). As people generally recall issues most useful and important to them, results

Design Element asked	% of right ansewers
Colour Scheme	72.50%
Decoration	56.25%
Lighting	63.75%
Furniture/Equipment	67.50%
Flooring	52.50%

Table. 4.6 Results from Detail Recall Survey

were interpreted as a guide to the priority attributed to design elements by the elderly. In comparing the memory recall of the subjects' own scheme and the visited one, it can be seen that they tended to recall more detail from their own scheme. This applies to the results in each selected area.

Furthermore, the results (Table 4.7) relating to the entrance area show that participants remembered greater detail of decoration and less of the flooring. In the common room area, subjects recalled more detail of colour and flooring issues and less of decoration. In the common room kitchen, subjects had a greater recollection of colour and lighting issues and less of the equipment therein. In the laundry, participants remembered equipment issues better and remembered less of the flooring issues. Finally, in the common shower room, subjects had a better recall of colour and less of the flooring issues.

Entrance area	
Colour	81.25%
Decoration	100.00%
Lighting	81.25%
Furniture/equipment	93.75%
Flooring	62.50%

Laundry	
Colour	68.75%
Decoration	56.25%
Lighting	56.25%
Furniture/equipment	87.50%
Flooring	31.25%

Common Shower room	
Colour	68.75%
Decoration	37.50%
Lighting	50.00%
Furniture/equipment	43.75%
Flooring	31.25%

Common room /lounge	
Colour	81.25%
Decoration	50.00%
Lighting	68.75%
Furniture/equipment	68.75%
Flooring	81.25%

Common room Kitchen	
Colour	62.50%
Decoration	56.25%
Lighting	62.50%
Furniture/equipment	43.75%
Flooring	56.25%

Table 4.7 Results from Detail Recall Survey on selected spatial areas.

4.6.3 Conclusion

The results obtained from the Detail Recall survey are based on elderly subjects' memory of those selected design elements, in order to determine the priority attributed to the five-selected design elements. In general, people remember the most important things to them. Therefore, the results show that the subjects recall greater detail of the colour scheme as opposed to other design elements, followed consecutively by, furniture, lighting, decoration and the least recalled detail being flooring. By identifying

the priorities of these design elements, the designer is provided with a useful guideline to determine which elements should be focused on and, thereby, helping to establish a more effective budget.

Additionally, subjects tended to recall more detail from their own scheme as opposed to the visited one. The detailed discussion of the findings between methods will be discussed in 6.3.

4.7 Perceptions of the sheltered housing

There were two different methods used to gather elderly persons' perceptions of recent sheltered housing design, which were: Sketch Map survey and User-centred Conversational Tour. The detailed processes of each individual method are discussed below.

4.7.1 Sketch Map survey

The Sketch Map survey was also employed to explore elderly persons' awareness of the selected interior spatial areas (detailed in chapter 4.5.3.1). With each drawing seen as a representation of their mental image of the space, each individual drawing, along with the relevant recorded video was analysed to elicit the subject's perceptions of the space. The methods used for the analysis and findings are outlined later in this chapter.

4.7.2 User-centred Conversational Tour

The main aim of this method was to discover elderly people's perceptions toward sheltered housing design and, moreover, to find out their level of satisfaction in each of the selected spatial areas.

In order to obtain in-depth information on the participants' perceptions toward sheltered housing design, they were asked to give their opinions and feelings relating to each individual selected spatial area of the real site. Also the narrative and visual information each participant expressed was recorded by via a digital video camera for further analysis.

4.7.3 Data analysis and findings

To gather more detailed information from collected data, two different types of approach were used to analyse the raw data. The results obtained from the quantitative assessment will provide the participants' level of satisfaction on each individual space and allow the author to make comparisons. The results gained from qualitative assessment provide more detail on the elderly participants' perception of the spatial design. Details on the both the quantitative and qualitative analysis processes are set out below.

4.7.3.1 Quantitative assessment and findings

The narrative information was collected from the actual site by adopting two distinct methods. Firstly, the User-centred conversational Tour and, secondly, the verbal information recorded from the subjects visit to the unfamiliar scheme as part of the Visual Record survey. This information, was then employed to determine the elderly subjects' level of satisfaction with each selected spatial area and, also, to reveal their perceptions of the sheltered housing design.

Throughout the Visual Record survey, most participants provided some opinions concerning the spaces they had visited without being prompted by any questions. This narrative information was recorded and collected from each subject and information was combined with data from the User-centred Conversational Tour to discover their perceptions and satisfaction relating to the design of the space. The details of the results analysis method used is discussed in the chapter 3.4.1

■ Findings

In general, there were 166 issues, regarding the five selected spatial areas, mentioned by participants in this survey. In the five selected spatial areas, the result (Table 4.8) shows that subjects were more satisfied with the design of the common room and laundry and less satisfied with the entrance area and common kitchen, particularly due to the size of the area. The order of the level of satisfaction for the five selected spatial areas are as follows:

1. Common room (80.30%)
2. Laundry (77.47%)
3. Common shower room (57.14%)
4. Common kitchen (52.17%)
5. Entrance area (46.88%).

In addition, for the common room, the subjects were more satisfied with its colour scheme (100%), as the light cream coloured paint made them feel that the space was more bright and spacious. However, they were less satisfied with the furniture (50%), as

Areas		Categories of Design Element								
			A	B	C	D	E	F	G	H
		Level of satisfaction	63.64%	73.33%	74.19%	53.85%	78.57%	67.74%	75.00%	50.00%
	Order of satisfaction level		6	4	3	7	1	5	2	8
Entrance	5	46.88%	33.33%	50.00%	44.44%	50.00%	66.67%	50.00%	N/A	42.86%
Comon room	1	80.30%	91.67%	88.89%	100.00%	62.50%	85.71%	50.00%	80.00%	66.67%
common kitchen	4	52.17%	28.57%	100.00%	100.00%	N/A	N/A	75.00%	100.00%	N/A
Laundry	2	77.47%	83.33%	50.00%	62.65%	N/A	100.00%	85.71%	N/A	N/A
shower room	3	57.14%	66.67%	N/A	N/A	N/A	50.00%	83.33%	N/A	N/A

Categories of Design Elements:

A: Room Size E: Lighting
B: Layout of space F: Furniture/equipment
C: Colour G: Space arrangement
D: Decoration H: Flooring

Table 4.8. Results from User-centre Conversational Tour.

most felt that the quality of the chairs provided was poor and out of date. In the laundry, subjects remarked that it was well lit (100%) but the layout (50%) could have been made simpler. For the common shower room, participants expressed satisfaction with the equipment (83.33%) and that this could be combined with a disabled toilet for maximum use of the space. Also pointed out was that the pattern of the tiles in this space should be kept 'simple but not boring'. Moreover, most participants were satisfied with the design of the common kitchen. However, they believe that the size of this space was far too small to accommodate the needs of the residents. Finally, the area that participants were least satisfied with was the entrance area, with its size prompting the most negative feedback.

In relation to the participants' level of satisfaction with the eight selected design elements, subjects expressed most satisfaction with lighting and least satisfaction with the flooring of the design. The order of the level of satisfaction for the 8 selected design elements were as follows:

1. Lighting (78.57%)
2. Spatial arrangement (75%)
3. Colour scheme (74.19%)
4. Layout of space (73.33)
5. Furniture and equipment (67.74%)
6. Room size (63.64%)
7. Decoration (53.85%)
8. Flooring (50%).

The results reveal that most participants were most satisfied with the element of lighting. However, participants expressed the need for improvements in the decoration,

particularly in the shower room and entrance areas. Improvements to the flooring were also viewed as necessary in the entrance.

In addition, the design issues that subjects' cited during the research, relating to the five selected spatial areas, were summarised as the subjects' perceptions and preferences regarding spatial design. Moreover, they indicate the direction of future design guidelines for the improvement of both current and future design. Identified design issues regarding each space area are presented in the next section.

4.7.3.2 Qualitative assessment and findings

(1) Sketch Map survey

Although the drawings are different in style, particularly in terms of the way they express the spaces, the displayed information indicates a strong perception of the space. Analysis of the Sketch Map survey involved the comparison of the individual drawings with the real site plan and an exploration of any apparent differences they revealed. Utilising the video record, contents of each drawing were then numbered with the order each subject followed in the drawing process and combined to highlight the similarities in each selected area between subjects. By determining a set of specific elements or areas it was hoped to gain insight into the spatial perception of the elderly people to the sheltered housing schemes.

(2) Narrative information

While this drawing exercise enabled the elderly participants to produce an expression of their cognitive map of the space within sheltered housing environment,

the verbal information regarding that space further supported the findings. Narrative information from the 8 subjects was reviewed, transcribed/simplified and classified into negative opinion (or suggestions on improvement) and positive opinion. This narrative was summarised as the subjects' perceptions and preferences regarding spatial design issues. Details of the results analysis were discussed in section 3.4.1 and the results are presented in the following section.

■ Findings

(1) Results from Sketch Map survey

In terms of the content of the drawings, participants were fairly consistent in their recollection of the individual space layout of furniture and equipment. Particular objects such as: pool table, piano or large round table were recalled with ease by the subjects whereas recollection of the spatial arrangement in some areas proved more problematic.

The results confirm that subjects recalled the common room more than any other selected spatial area. This was followed, in order, by the entrance area, laundry, common room kitchen and, finally, the least recalled being the common shower room. Most participants' drawings were in scale, particularly with the size of the furniture or equipment. For example, figure 4.10, demonstrates that the furniture, e.g. chairs and tables within the common room, are drawn correctly to scale.

In addition, studying the participant's drawings, in general, showed that most could produce an approximate record of the floor plan and layout of their own building much better than the visited one. Figure 4.10 (P.172) displays an example of the drawings by

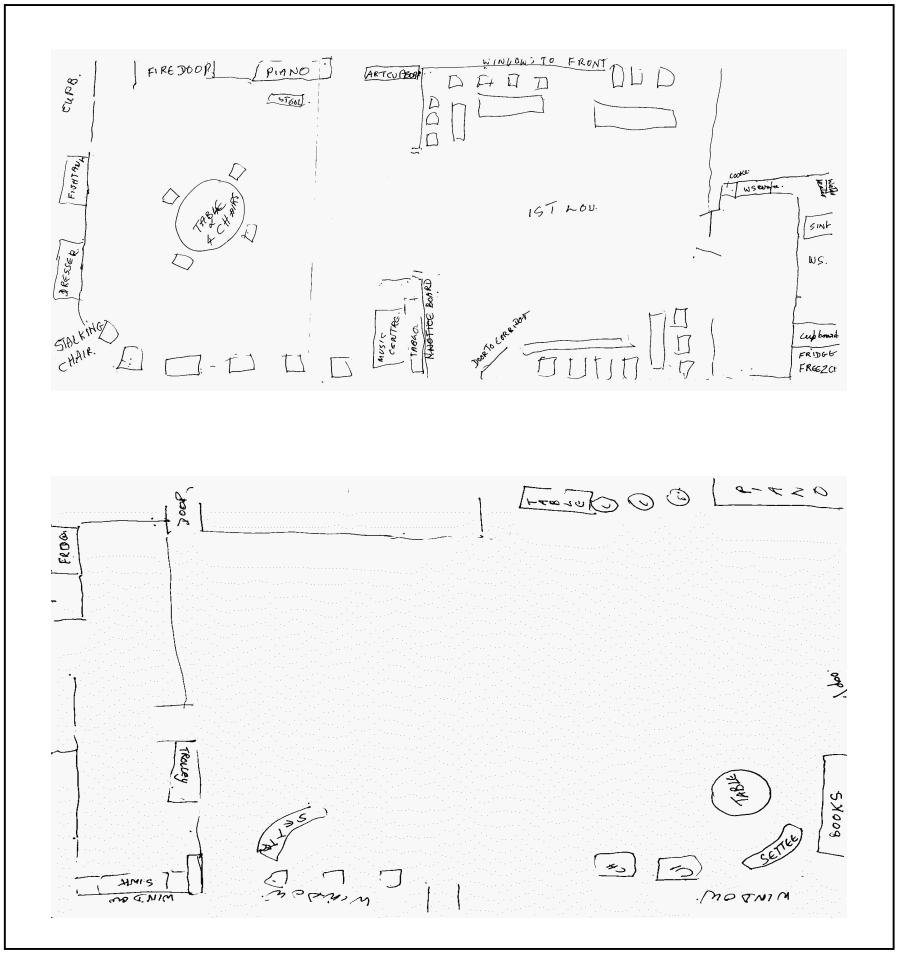


Figure. 4.10 Example drawings of 2 different common room, subject's own scheme (Above) and visited scheme (Below) by Yvonne

the same participant on two different buildings. The drawing in figure 4.10 is much clearer and has more correctly identified items and elements in it than is the case for the drawing below. This, therefore, shows that the participants have a more indistinct memory of the visited scheme, as their drawings appeared confused and that they struggled with relation between the elements.

Moreover, some subjects explained that they felt the building was massive and too

complicated for them to remember. Consequently, for the purposes of this study, the subjects' memory on the layout of whole building and location of each individual area was not explored further. Therefore, the focus was centred on the drawings of each of the selected individual spaces.

The key findings from the Sketch Map survey in each area are analysed below:

- **Entrance area**

The data from the subjects' drawing process reveal that most started their drawings from the main door of the building and then outlined the entrance space and the corridors leading to other spatial areas. Following this, most subjects drew those elements closest to the main door, which were invariably, the lift or stairs. It can be seen then, that most subjects have a fair recollection about the layout of this space and also where the corridor leads to (Figure 4.11). However, only a few subjects were able to illustrate how the furniture and other elements were arranged, especially in the visited scheme.

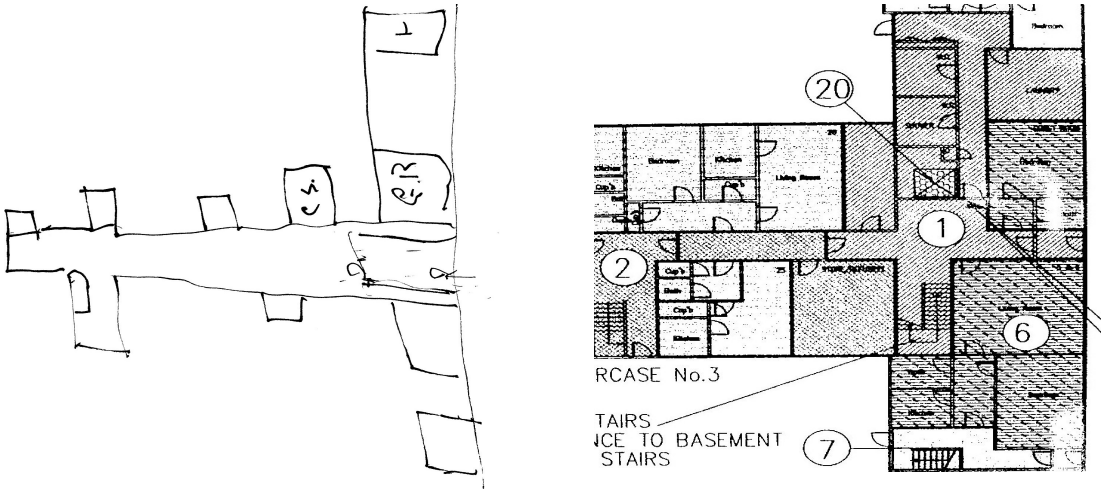


Figure 4.11. Example drawing of the entrance area by Allan (Left) compare with real site layout (Right)

The results indicate that people see entrance areas as transition space within the building. The subjects easily understand where they lead to but are unaware of the spatial arrangement or details within this area.

➢ **Common room**

Most subjects commenced their drawing of the common room with either an outline of the space or from the door. In both their own and the visited schemes subjects recalled most of the items of furniture inside the common room, as well as their arrangement. (Figure 4.12) Moreover, special items such as fish tanks, pool tables etc were recalled more readily. However, most subjects were unable to recall more specific

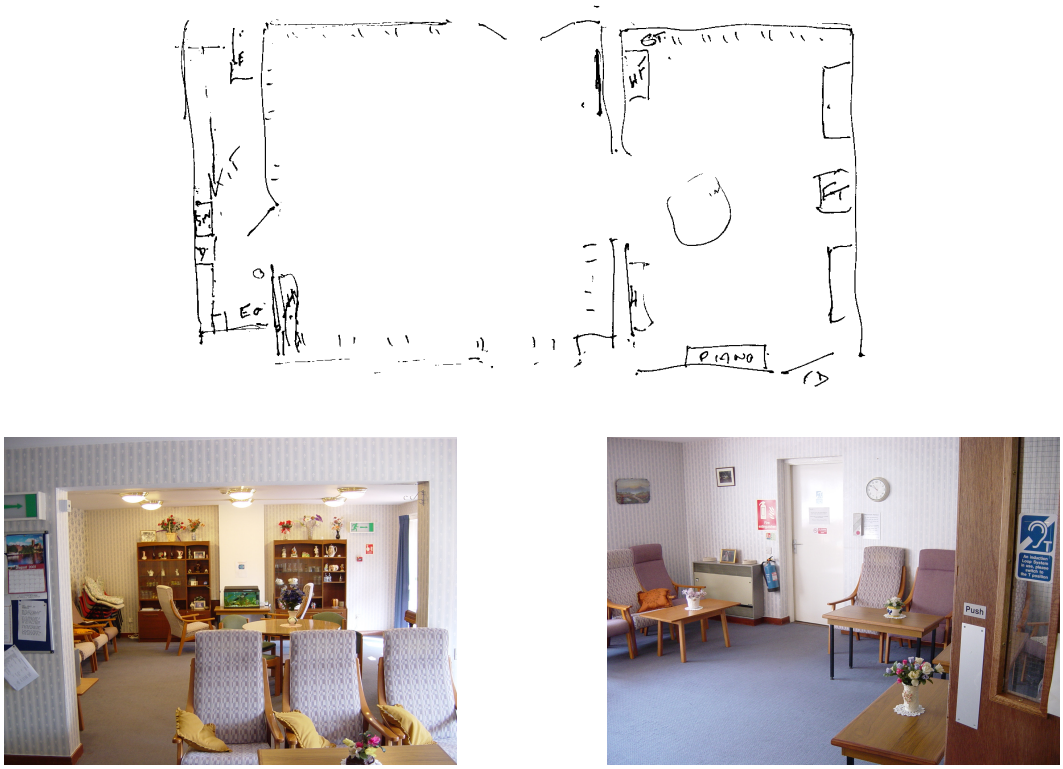


Figure 4.12. Example drawing of common room by James (Above) compared with the real site layout. (Below)

details e.g. the numbers of chairs and tables within the space.

Overall, it can be seen that the subjects had a greater recollection of the common room than other selected areas. This would seem to indicate that people view the common room as an important area and that the attention paid to this environment may be linked to their everyday usage of the space and the time spent in each area.

➢ **Common kitchen**

The drawings, here, show that the subjects were clear on the numbers of equipment contained in the kitchen of both schemes (figure 4.13). However, recollection of where this equipment was located was more vague, especially within the visited scheme. The results demonstrate that subjects view equipment in the common kitchen as an important issue compare with the spatial arrangement of the space.

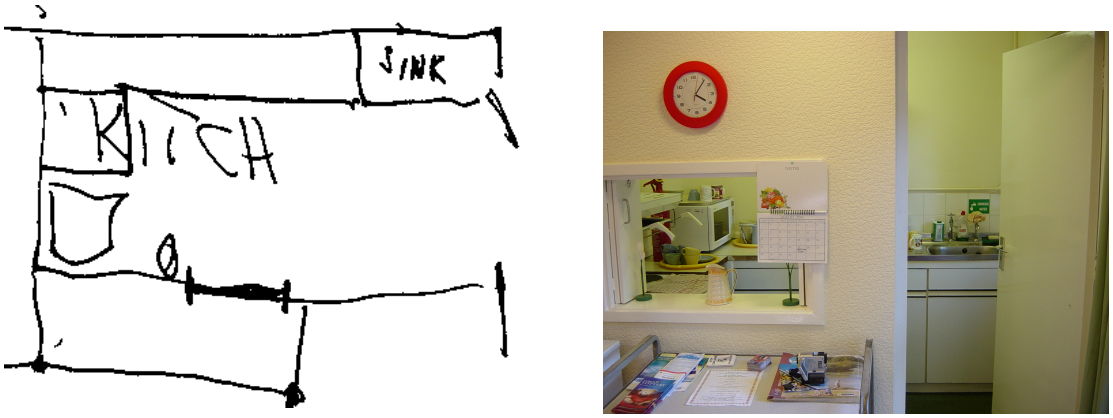


Figure 4.13. Example Drawing of common kitchen by Pop (Left), compared with the real site layout. (Right).

➢ **Laundry**

The drawings of the laundry (figure 4.14) illustrate that washing machines and driers appear to be the most important issues, as most subjects are readily able to recall the numbers of equipment therein. However, it should be pointed out that a number of omissions were made concerning the spatial arrangement. Particular items such as radiators, chairs and working tables were not represented in any of the drawings. In addition, they viewed the laundry as a functional space. Other issues, it would seem, like spatial arrangement were of less interest to the subjects.

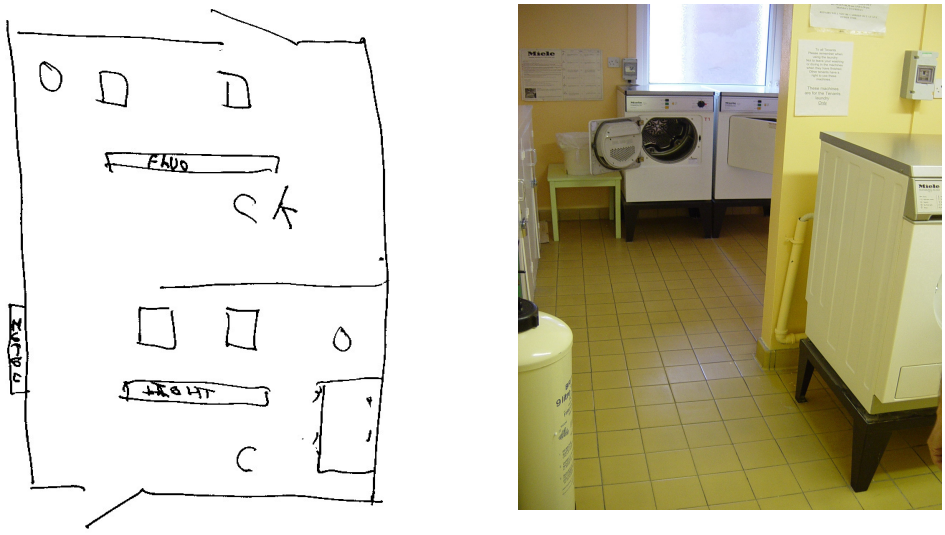


Figure 4.14. Example drawing of laundry by Pops (Left), compared with the real site layout. (Right).

➢ **Shower room**

From the results, only half of the subjects were able to recall how the shower room was arranged (figure 4.15, P.177). Most subjects only remembered the location of the shower but explained that they never used the shower room in their own schemes and it

was, generally, only accessed by people who use the guest flat. In one case, the subject used the shower room because the hairdresser used this space to cut hair. Nevertheless, only a few of the subjects remembered the equipment within this area but were even more confused as to the spatial arrangement.

The results, therefore, demonstrate that the common shower room is only perceived as a functional space and one that is not very often utilised. However, the participants emphasise the importance of the equipment in this space and view its spatial arrangement as less of an issue for them.

Figure 4.15 Example of a drawing of common shower room by Pops (Left), compared with the real site layout. (Right).

(2)Result from narrative information

The following issues were frequently pointed out by the subjects during the User-centred conversational Tour and Visual Record survey and taken as their perceptions to recent spatial design, all of which need to be considered when designing interior spaces. In addition, every issue listed below either had been mentioned by more

than a 1/3 of participants or were specially selected by the author in relation to its importance.

In general, lighting including artificial and natural light is extremely important to elderly people. It is essential, with staircases, shower rooms and kitchen areas, that Health and Safety issues are addressed in order to provide a safer environment for elderly people. Besides, most subjects stated that light and bright colour paintwork is pleasant because it makes the space feel brighter and spacious. In addition, most subjects commented that, the colour of the carpet, curtains and paint on the wall should be more coordinated. More detail on the elderly subjects' perceptions of each selected spatial area is provided in *appendix Ⅳ- Ⅴ*.

The identified design issues concerning each selected spatial area are summarised below (Ⅰ-Ⅶ) and the full list of design issues identified are presented in *appendix Ⅲ-Ⅲ*.

I. Building entrance area

The following issues need to be considered when designing the building entrance area:

- Entrance area should be adequately sized, and the main door should be recognizable, making it easier for the elderly residents to identify.
- The UPVC door makes the space feel more secure and clean to the subjects.
- Decorating the area with pictures and flowers can make an entrance area more spacious and attractive. Consequently this makes the area seem less like an institution.
- An entrance area with a few seats and a view of the garden would present people

with a more welcome feeling and would function as an area to sit while they were waiting.

- Carpet in the entrance area should, preferably, be in a dark colour as people walk directly over it from the outside.

II. Common room

The design of the common room should take into consideration the following:

- Decorating with pictures and real flowers can make the common room more attractive.
- Colour of the pictures used to decorate the space can affect residents' emotion.
- Comfort of seating could have a significant affect on their frequency of usage.
- Simple designed wallpaper or light paintwork is the most desirable for the common room.
- Location of the heating radiators is extremely important as they may prove hazardous for the elderly residents.
- Chairs situated along the perimeter of the room make the area feel more spacious.
- A window view from the seating area is important; especially as windows can bring in daylight to make the space brighter and pleasant.
- Building layout and the location of the common room is extremely important, as this will affect the use of natural light.
- Facilities such as magnifiers (a device that can enlarge writing to help elderly people to read) will enhance residents' use of the common room, particularly those with sight impairment.

III. Common room kitchen

The design of the common room kitchen should consider the following:

- Size is an important issue for the common room kitchen and the design should consider the activities for 2-3 people working at the same time. The installation of Sliding doors can save significant space in the kitchen
- Bright paintwork and good furniture/equipment can create a friendly environment.
- A hatch between kitchen and common room is convenient for the elderly residents..
- Where kitchen windows face public areas, a blind may be desirable.

IV. Laundry

The design of the laundry should consider the following:

- Having two laundries on different levels would be helpful for people with mobility difficulties
- The size of the drip dry area should consider the number of the residents in the building
- Equipment and furniture are important issues in laundry as it is a functional space for the resident.
- Partition between the washing machine and drier is not necessary.
- Size is not an important issue for the laundry, as long as it provides enough space for the activities.
- A message board in this common space can encourage communication between residents.

V. Common shower room

Design of the common shower room should consider the following issues:

- Size of the shower room should be enough for its function and should accommodate wheel chair users
- Seated showers and other assisted facilities are essential to the elderly residents.
- Disabled toilet and shower room can be modified as one unit to make maximum use of the space, particularly as few residents actually use the common shower room.
- The pattern of the tiles on the wall should be kept simple but not bland.

VII. Other Issues

- Building layout should take into consideration the elderly resident's abilities by avoiding too many levels. This is important as it will simplify the way-finding for the residents.
- In order to ensure more privacy when a corridor leads to a public space, it would be preferable to install frosted glass or a blind as opposed to clear glazing.
- Use of different colours to define floor levels makes them more easily identifiable to the elderly residents.
- The positioning of windows along the corridor can make use of the natural light and provide information from the outside world.
- Corridors decorated with pictures (especially personal pictures or drawings) and plants, can make the space feel homely and cozy.

- Providing some seating areas on upper floors with the view of garden can help residents who unable to travel to the downstairs lounge.
- Staircase with open window can bring in more natural light and view of the outside environment.
- Spy holes in each flat door would enable the subject to feel more secure.
- The refuse area should be located at ground floor level and a convenient linked chute should be provided for the upper levels.

4.7.4 Conclusion

This section provided two distinct methods used to obtain information on participants' perceptions toward sheltered housing design. The results from the Sketch Map survey demonstrate that subjects recalled the common room better than entrance area, followed by laundry, common room kitchen, and finally, the least recalled being the common shower room. Participant's drawings were placed together and divided into selected spatial areas in order to compare the similarities between subjects. Meanings were interpreted by observing both the linear order followed by each subject to produce their sketch map and the contents of the sketch. The results together with the findings from the User-centred Conversational Tour, relating to the five selected spatial areas were sumarised as the subjects' perceptions and preferences regarding spatial design.

Moreover, results acquired from the User-centred conversational Tour also present the participants' satisfaction level of individual spaces. Therefore, the results show that the order of satisfaction in relation to the five selected areas, are as follows: 1.common room 2.laundry 3.common shower room 4.common kitchen 5.entrance area. The results on design elements demonstrate that subjects were more satisfied with spatial arrangement and lighting issues and less satisfied with layout of space and decoration elements of the recent design.

The findings, which include identified design issues together with statistical data concerning each area, need to be considered when designing interior spaces for elderly people in order to improve both current and future design.

4.8 Conclusion

The basis of this study was to enable elderly residents, themselves, to make a definite contribution to the improvement of their own physical environment, in this case the sheltered housing.

A substantial amount of data was gathered from the survey methods employed here, and the findings provide strong evidence of the subjects' personal responses to their physical environment. Furthermore, the findings provide a greater understanding of how elderly people observe unfamiliar space. The findings also reveal awareness of elderly persons' priorities toward the selected spatial areas and design elements within a scheme. It may be suggested, therefore, that these findings could not be satisfactorily established via conventional interview techniques.

Moreover, results from the User-centre Conversational Tour and Sketch Map survey have provided an understanding of elderly persons' perceptions of the sheltered housing space design and their spatial design preferences. The benefits of this research are that it could be taken to establish budget priorities relative to the building of new sheltered accommodation and should certainly be considered in the design or modification of residential environments for the elderly. However, the results of this study have some limitations because of the sample size of the subjects and buildings visited. Nevertheless, the fact that the results gathered via different methods on priority of spatial areas and design elements are very similar, strongly suggests that this passive technique of information gathering has definite potential in this particular context. Furthermore, a questionnaire survey was carried out to determine the elderly subject's priorities on both the selected spatial areas and design elements. Following this, interviews with various professionals were carried out to evaluate the research methods

used and its findings, the details of which are explored in chapter 5. This reveals that the results from this questionnaire are similar to the research findings. Indeed, the professional interviewees are agreed on the validity of using multi-methodologies to collect evidence from the elderly subjects, in relation to their awareness of designs and spatial areas. In addition, a discussion of each of the individual methodologies used in this research and their connections are presented in chapter 6.

CHAPTER 5.

RESEARCH EVALUATION

5.1 Introduction

There were two different methods employed to evaluate the research findings and methodologies used. Firstly, a questionnaire survey was adopted to ascertain the elderly subjects' priorities on both selected spatial areas and design elements. Secondly, an interview survey was carried out to gather opinions from professionals who currently work in architectural or interior design firms or have experience in spatial design disciplines. Their opinion and suggestions were analysed, put into discussion and used to improve the research methodology for future study or made available to researchers interested in adopting these methodologies.

5.2 Questionnaire

5.21 Introduction

The key aims of the whole research were to explore the difference between methodologies in obtaining opinions from elderly people for determine the priority they afforded the design elements and spatial areas of a building environment. Therefore, a comparison was required between the methodology employed in this research and a standard questionnaire survey. To achieve this, a questionnaire *(see appendix V- I)* was designed and used to gauge subjects' opinions on their priority of these selected design elements and spatial areas. Furthermore, the results from this questionnaire were utilised to evaluate and validate the research findings.

In order to carry this out, residents from Frederick Jackson House were chosen for the survey, as most participants (6 out of 8) were visiting or living in this scheme when completing the Visual Record Survey. In total, there were twenty-seven questionnaires sent out, of which sixteen were returned. With the addition of results from the original 8

participants, there were twenty-four questionnaires gathered in total for analysis.

It is important to note that the questionnaire, as for the original eight participants, was conducted after all the other experimental studies were completed. The reason for this is because the researcher did not want the participants to be aware of the real aims behind each methodology, so the whole process would be more natural and any bias effectively eliminated. For example: in the Detail recall survey, if subjects were aware that their answers would be calculated and used as priority of the elements, they might, consciously, try to recall as many elements as possible before commencing the study, thereby making the resulting data less reliable.

5.2.2 Data analysis

To effectively analyse the results, the information on the priority of design elements and spatial areas, provided by subjects, was transcribed in table form. This assisted in determining the "Mode" of the selected design elements or spatial areas. In terms of statistical data, this means that "Mode is the most frequently occurring value in a set of discrete data. Easton & McColl (1997) point out that, " there can be more than one mode if two or more values are equally common." For instance, the "Mode" for the entrance area is recorded as 1, meaning that most subjects selected entrance area as the most important area.

Moreover, these results were then compared with the findings from the Visual Record survey (VRS), Sketch Map survey (SMS) and Detail Recall survey (DRS). The researh process, then, is presented in Figure 5.1, P.189.

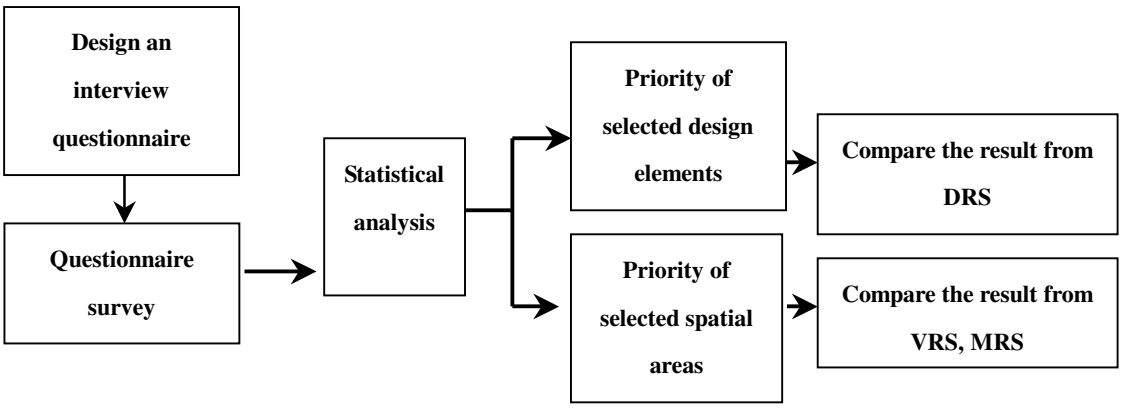


Figure 5.1. Outline of questionnaire process

5.2.3 Findings

5.2.3.1 Priority of selected spatial areas

The questionnaire results on the priority of the five selected interior spatial areas (Table 5.1, P.190) for the elderly people, within the building environment, are analysed below:

Most subjects considered that the "entrance area" was the most important spatial area that they would focus on, if looking to choose this scheme to live in. Indeed, most elderly subjects (10 out of 24) chose "entrance area" as their first priority. The second area of importance was "common room" with 9 out of 24 subjects selecting this as their second priority. Most people (10 out of 24) chose "laundry" as priority 3 "Common kitchen" was chosen as priority 5 (15 out of 24). Subjects ranked the shower room as the least significant area (19 out of 24). These results, then reveal that approximately 73% of subjects chose "entrance area" and "common room" as priority 1 or 2 and about 82% of subjects chose "laundry", "common kitchen" or "shower room" as priority 3, 4 or 5.

	Alan	Patricia	Sue	Joyce	Pops	Yvonne	James	Norma	S9	S10	S11
Entrance area	3	2	3	3	3	2	3	3	1	1	1
Common room	1	1	1	1	2	1	1	1	2	3	2
kitchen	2	4	2	4	5	3	2	5	5	4	5
Laundry	4	3	4	2	1	4	4	2	3	2	3
Shower room	5	5	5	5	4	5	5	4	4	5	4

S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	Mode	Proportion
2	1	3	1	2	1	2	1	2	1	1	1	2	1	10/24
3	2	2	3	1	2	1	2	3	2	2	3	3	2	9/24
4	4	4	5	4	4	4	4	4	4	4	4	4	4	15/24
1	3	1	2	3	3	3	3	1	3	3	2	1	3	10/24
5	5	5	4	5	5	5	5	5	5	5	5	5	5	19/24

Table 5.1. Results from questionnaire: priority of 5 selected spatial areas

Furthermore, a comparison of the results from the questionnaire with the Visual Record and Memory Recall survey has revealed many similarities with the only difference being the choice of the first and second priority. Therefore, this provides evidence to validate the indirect methodological approach used in this study. Additionally, the questionnaire findings demonstrate that participants feel the “entrance area” was the most important space for them. Similarly, results gained from the Memory Recall survey also reveal that subjects recalled greater detail of the “entrance area” than they could with other selected spatial areas. Moreover, the result of the Visual Record survey shows that the “entrance area” was the space that participants spent more time investigating than other spatial areas (except “common room”), when visiting the scheme. The findings, here, demonstrate that, while exploring an unfamiliar space, elderly people tend to spend more time investigating the space they think is more important to them and, ultimately, recall more detail of the design elements.

5.2.3.2 Priority of selected interior design elements

The questionnaire results on the priority of eight selected interior elements, for the elderly people within the building are analysed below. Table 5.2 displays the answers provided by each subject. A majority of the subjects (16 out of 24) chose "size of the room" as first priority. "Layout of space" was selected as priority 2 (13 out of 24). "Space arrangement" and "Colour" were chosen as priority 3 (12 out of 24) and 4 (14 out of 24) respectively. Priority 5 was furniture/equipment (12 out of 24). Approximately a third of subjects selected "lighting" as priority 6 (8 out of 24). Most participants chose "decoration" as priority 7 (11 out of 24). Finally, flooring was selected as the least important element for them (14 out of 24). Moreover, a comparison of the results reveals that, in relation to the interior elements, more than a third of subjects chose them in the same order of priority.

Furthermore, by dividing the eight selected elements into high priority (priority 1 to

	Alan	Patricia	Sue	Joyce	Pops	Yvonne	James	Norma	S9	S10
room size	1	1	1	6	2	1	1	1	1	1
layout of space	2	4	2	1	1	2	7	2	2	2
colour	4	3	4	5	7	3	2	3	4	6
decoration	6	5	6	7	5	4	6	8	5	7
lighting	7	6	7	2	8	5	5	4	6	5
furniture/equipment	5	8	5	4	4	7	3	7	8	3
space arrangement	3	2	3	3	3	6	4	5	3	4
flooring	8	7	8	8	6	8	8	6	7	8

S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	Mode	Proportion
2	1	3	1	3	1	2	1	1	3	1	2	1	1	1	16/24
1	2	2	2	1	2	3	2	3	1	2	1	2	3	2	13/24
4	4	4	3	4	4	1	4	2	4	4	4	4	4	4	14/24
6	7	7	7	7	8	7	7	5	7	7	6	8	7	7	11/24
7	8	1	8	6	6	8	6	8	5	6	7	6	6	6	8/24
5	5	6	5	5	5	6	5	6	6	5	5	5	5	5	12/24
3	3	5	4	2	3	4	3	4	2	3	3	3	2	3	12/24
8	6	8	6	8	7	5	8	7	8	8	8	7	8	8	14/24

Table 5.2. Results from questionnaire: priority of 8 selected design elements.

4) and low priority (priority 5 to 8), the results show that about 87% of subjects chose "room size", "layout of space", "space arrangement" and "colour' as the high priority group and about 92% of participants chose another four as the low priority group. In addition, about 71% of subjects selected "size of the room" or "layout of the space" as priority 1 or 2. The results reveal that these two elements are extremely important for the subject when choosing their accommodation.

Moreover, in order to make a coherent comparison of the questionnaire results with the Detail Recall survey, three particular elements: size of room, layout of space and space arrangement needed to be eliminated from the list, as these could not be determined by using the Detail Recall survey. The main difficulty is that narrative is an inadequate form to measure the answers given by each subject in relation to those three specific design elements. Thus, the results on the remaining five selected elements were as follows (Table 5.3.): Most subjects selected "Colour" to be their first priority. "Furniture" was chosen as second priority. "Lighting" and "decoration" issues were chosen as third and fourth priority respectively. Most subjects stated that the floor was the least important element of all the five selected elements. In addition, approximately

	Alan	Patricia	Sue	Joyce	Pops	Yvonne	James	Norma	S9	S10
colour	1	1	1	3	3	1	1	1	1	3
decoration	3	2	3	4	2	2	4	5	2	4
lighting	4	3	4	1	5	3	3	2	3	2
furniture/equipment	2	5	2	2	1	4	2	4	5	1
flooring	5	4	5	5	4	5	5	3	4	5

S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	Mode	Proportion
1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	20/24
3	4	4	4	4	5	4	4	2	4	4	3	5	4	4	12/24
4	5	1	5	3	3	5	3	5	2	3	4	3	3	3	10/24
2	2	3	2	2	2	3	2	3	3	2	2	2	2	2	14/24
5	3	5	3	5	4	2	5	4	5	5	5	4	5	5	14/24

Table 5.3. Results from questionnaire: priority of 5 selected design elements.

77% of participants selected “colour” or “Furniture/equipment” as their first or second priority when choosing accommodation to live in.

5.3 Interview with professionals

5.31 Introduction

The aim of the interview was to provide an additional method to evaluate the research findings and methodologies used and, therefore, to develop and improve the methods following the suggestions and recommendations from professionals. In order to achieve this, the objectives were:

1. To select interviewees and arrange interview schedule
2. To design interview questions
3. To interview the professionals
4. To analyse the results from each interviewee
5. To draw conclusions and use as guideline to adjust the research methods

There were nine professional people selected for the interview survey, all with at least seven years practice in architecture or an interior design discipline. However, as their availability for interview was limited to a short period of time, a concise list of questions and a confirmed time schedule were deemed essential. Furthermore, in order to carry out the interview survey a questionnaire was designed, with reference to interview standard operation procedures (see Appendix Ⅴ-Ⅱ). Also, to request the interviewee's permission to record the interview on a digital voice recorder. Following this, all interview conversations were then transcribed and reviewed by use of both qualitative and quantitative methods. The research evaluation process and framework is displayed in Figure 5.2 (P.195) and the details are explored in the section below along with its findings.

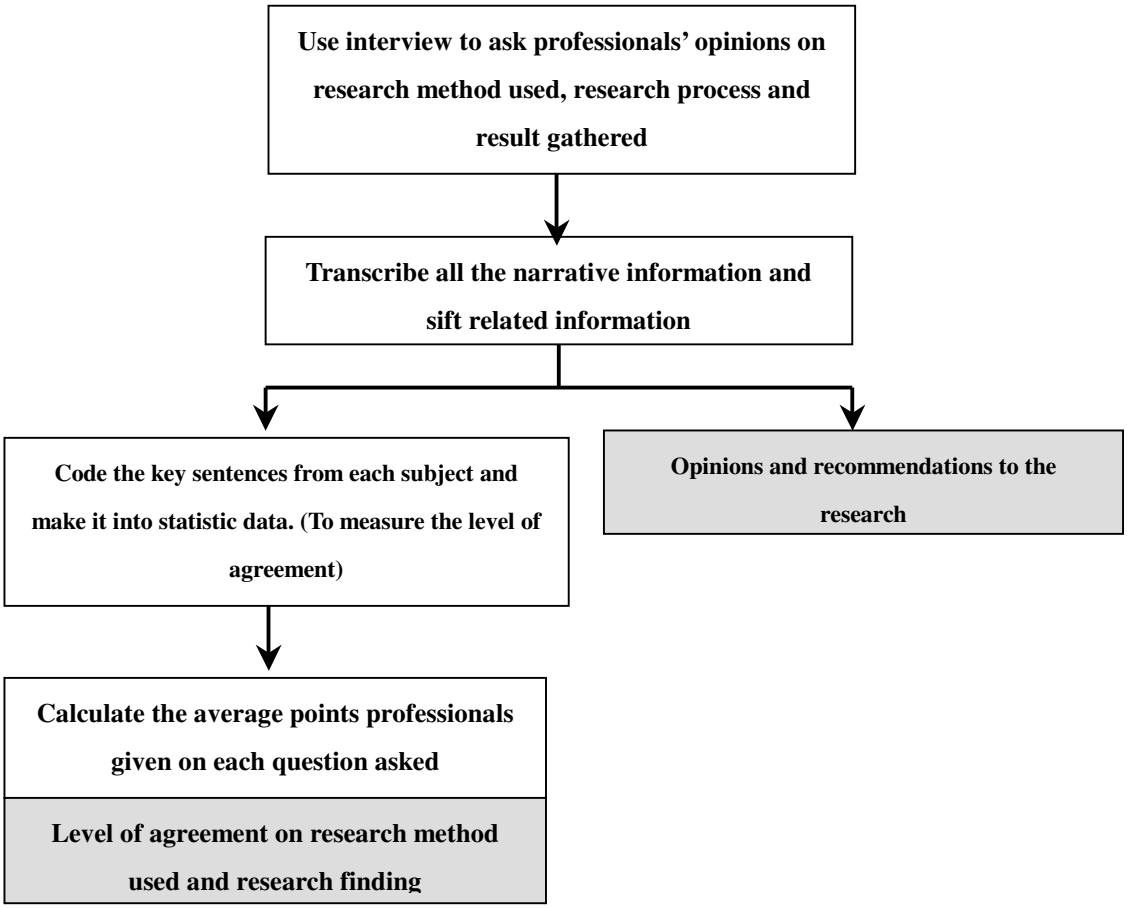


Figure 5.2. Outline of research evaluation process and framework.

5.3.2 Interviewees

There were nine professional people selected for the interview survey (see Table 5.4, P.196). These comprised: four architects and five interior designers of which four are also Senior Lecturers in interior design courses at DMU. All subjects have a combined average of seventeen years experience and at least seven years practice in architecture or interior design disciplines. The reason these professionals were chosen from interior or architectural fields was because the research, from the beginning, was centred on an interior architecture design perspective. This viewpoint was maintained

throughout the whole research in order to investigate and discuss the relationship between interior space and elderly people. Therefore, their experience can provide a practical view to the study and, hence, evaluate the body of research and present valuable suggestions for future study.

Professionals	Job title/experiences	Duration (years) in the field of interior design or architecture
Anne	Architect (senior assistant)	25
Brian R	Architect (project manager)	20
Brian W	Interior designer & Senior lecturer	16
Chong	Architect	9
Huei-Ju	Interior designer	10
Matthew	Architect	8
Paul	Interior designer & Principal lecturer	37
Rebecca	Interior designer & Senior lecturer	7
Stuart	Interior designer & Senior lecturer	24

Table 5.4 Background of selected interviewees.

5.3.3 Interview questions

The open question technique was used for the interview because the essential aims of the interview were to gather the professional participants' opinion. Moreover, the adoption of open questions could possibly yield more detail of the participant's thought process and reveal the reasons behind their opinion, more so than closed questions

(Gillham 2005).

Prior to the interview, a questionnaire was designed incorporating standard operation procedure (s.o.p) *(see appendix. Ⅴ-Ⅱ).* Therefore, in order to avoid any bias when conducting the interview, each participant would hear exactly the same description about the research followed by the questions, also making the result much easier to analyse. The interview questions were divided into four sections comprising seventeen questions in total, related to the research process, methodologies used and findings. The first section of the interview questions was to gain details of the individual professional, including their working experience and current job responsibility. The questions in regard to the research were commenced in the second section (questions 1 to 8). At the beginning of each question there was a brief introduction of the research process and methods used, essentially aimed at gathering their opinions of these. The third section (questions 9 to 13) was aimed at acquiring the professionals' opinion on the research results and to compare them to their own expectations. The last section (questions 14 and 15) was to ask their opinion on the overall project and their experience on how designers deal with budgets in real situations. Overall the interviews lasted between 45 minutes and an hour.

5.3.4 Data analysis

5.3.4.1 Introduction

Being a qualitative study, the information received from the interviews uses qualitative discussion as the process of data analysis. However, by adopting this approach some information still remains in its original form and cannot therefore be analysed. Hence, in this study, both a quantitative and qualitative analysis method was

employed in order to extract more information from their input. Furthermore, by using a quantitative method, it becomes easier to determine the level of agreement in response to the question asked. These two methods of analysis are discussed in the next section and the findings will be presented in section 5.3.5.

5.3.4.2 Qualitative assessment

The aim of the qualitative assessment is to analyse the narrative information obtained during the interview and assess what participants actually think in response to the questions asked. Moreover, this approach allows integration of their responses as guidelines to improve the research for the future.

To analyse the information from the open questions, the narrative recorded during the interviews were transcribed into text. Furthermore, in order to clarify the issues arising from the narrative information, the transcribed data from the nine professionals was closely examined to determine key sentences related to the questions asked. Finally, these were summarised as the professionals' opinion and suggestions in regard to each question.

5.3.4.3 Quantitative assessment

The quantitative assessment was used to support the qualitative method. By converting the narrative information into statistical data, an understanding of the level of agreement and the comparisons to be made between each subject would be revealed. Moreover, the aims of the interview were to evaluate the research findings and methodologies used and enable an analysis of the substantial data from narrative information. For this purpose a protocol (Table 5.5) was designed to code the key

sentences from each subject and transform them into statistical data. In order to achieve this a points system

Level of agreement	Points		Level of agreement	Points
Strongly agree	**4**		**Expect the result**	**4**
Agree	**2**		**Not surprised**	**2**
Neutral	**0**		**Neutral**	**0**
Disagree	**-2**		**Surprised**	**-2**
Strongly disagree	**-4**		**Not expect the result at all**	**-4**

Table 5.5 Protocol used to code the key sentences from each subject

was employed to measure the level of agreement on different methodologies used and the level of expectation on research results. For example, 4 points were given when the participant strongly agreed with the statement from the question. 2 points were given when they agreed with the statement. In addition, if they had any doubt about the statement, no point was given. However, when they disagreed with the statement 2 points were taken (-2) from the total points and when they strongly disagreed, 4 points were taken (-4) from the total points. Average points for individual questions will be calculated as their level of agreement. Furthermore, all the data was transferred into excel to compare the results from different participants. *(see appendix Ⅴ-Ⅲ).*

5.3.5 Findings

Apart from asking the participants details about their working experience and background detail, there were fifteen questions to which the participants were asked to respond including: research rationale, participants expectation, research methods used and result. This section will describe the results analysed from the interview and the relation between those findings.

(1) Research rationale

The result on the selected design elements and spatial areas for the research within the sheltered housing schemes shows that the average points attributed to questions on the selected design elements were 1.78 points, which means that most subjects were generally agreed with the design elements chosen. Most professional subjects thought that the majority elements chosen were suitable. However, a number of them claimed that the "colour scheme" would be difficult to separate from "decoration", as these two elements normally affect each other and are closely related. In addition, some professionals thought that the "space accessibility (disabled access)" and "heating arrangement" should be included in the list for comparison.

With selected spatial areas, the average score was 3.33 points, which means the majority of subjects agreed with the spatial areas chosen and think the list should cover all interior areas except individual flats which are excluded from this research. From the results, it can be seen that most professionals generally agreed with the design elements and spatial areas selected for comparison. In addition, they expressed slightly more opinions on the design elements selected rather than spatial areas. The researcher maintains this is because it is more difficult to provide a satisfactory definition of each individual design element than it is of spatial areas.

(2) Participants expectation

When questioning the professionals' expectations on the importance of the eight selected interior elements for the elderly subjects, within the sheltered house scheme, most expected that subjects would select "Layout of space" as priority 1, Priority 2 as "space arrangement" and third priority specified as "size of the room". Lighting and Furniture/equipment were chosen as priority 4. "Flooring" was selected as priority 5 or 8 and "Decoration" as priority 6. Most professionals chose Colour as the least important elements for the elderly subjects (Table 5.6). In addition, when only concerned with the results of the five-selected design elements, most professionals' expectations were as follows (Table 5.7, P.202): most expected "Furniture/equipment" would be priority 1 and "Lighting" would be selected as priority 2. "Colour" was expected to be priority 3 or 5 and "Flooring" as priority 4 or 5.

On the ranking of the five selected interior areas within the sheltered house scheme (Table. 5.8, P.202), most professionals expected that the "common room" would be the

	Ann B.	Brian R.	Brian W.	Chong	Wu	Matthew	Paul	Rebaca	Stuart	Mode	Proportion
A	2	1	1	5	8	3	3	3	6	3	3/9
B	1	4	3	1	7	5	2	1	2	1	3/9
C	6	7	8	2	4	2	6	8	8	8	3/9
D	5	5	6	8	6	1	6	7	7	6	3/9
E	4	6	5	4	3	7	5	6	4	4	3/9
F	7	3	4	6	1	6	4	4	3	4	3/9
G	3	2	2	7	2	4	1	2	1	2	4/9
H	8	8	7	3	5	8	7	5	5	5 or 8	3/9

Categories of Design Element:

A: Room Size
B: Layout of space
C: Colour
D: Decoration
E: Lighting
F: Furniture/equipment
G: Space arrangement
H: Flooring

Table 5.6. Professionals' expectations on the priority of 8 selected design elements.

	Ann	Brian R.	Brian W.	Chong	Wu	Matthew	Paul	Rebaca	Stuart	Mode	Proportion
C	3	4	5	1	3	2	3	5	5	3 or 5	3/9
D	2	2	3	5	5	1	3	4	4	2, 3, 4 or 5	2/9
E	1	3	2	3	2	4	2	3	2	2	5/9
F	4	1	1	4	1	3	1	1	1	1	7/9
H	5	5	4	2	4	5	4	2	3	4 or 5	3/9

Categories of Design Element:
C: Colour
D: Decoration
E: Lighting
F: Furniture/equipment
H: Flooring

Table 5.7. Professionals' expectations on the priority of 5 selected design elements.

most important area to the elderly subjects. Furthermore, the professionals' expectation was that common kitchen would be ranked as second or third priority. Most believed that the laundry would be the subjects' third priority. Fourth in importance was considered to be the entrance area and that the least important area would be the common shower room.

	Ann	Brian R.	Brian W.	Chong	Wu	Matthew	Paul	Rebaca	Stuart	Mode	Proportion
Ea	5	4	4	1	2	4	3	4	2	4	4/9
Cr	2	2	1	5	1	1	1	1	1	1	6/9
Ck	3	3	2	4	3	5	2	2	4	2 or 3	3/9
La	1	1	5	3	4	2	5	3	3	3	3/9
Cs	4	5	3	2	5	3	4	5	5	5	4/9

Categories of space areas:
Ea. Entrance Area La. Laundry
Cr. Common room Cs. Common shower room
Ck. Common room kitchen

Table. 5.8. Professionals' expectations on the priority of 5 selected spatial areas.

(3) Research methods used

The average score on the Visual Record method was 1.78 points (agree). Most professional interviewees agreed that the visual Record method is useful, in that it is an effective method to identify the subject's awareness of spatial areas. They also maintained that the Visual Record survey was effective in revealing what the subjects were paying particular attention to. However, they have expectations that some bias

might affect the results. For example: they believe elderly subjects might spend more time in one particular area because they saw something that was different to what they expected to see. Moreover, they see other reasons why the elderly subjects would spend a longer time in a specific place, such as the presence of an unusual design or, in some instances, items that they disliked or saw a problem with. More specifically, some professionals suggest that a follow up interview could be carried out after the survey. The benefit of this would be to help clarify the information and, possibly, help to identify the real motives behind the time they spent in each area.

When asking the professionals their opinion and comments on the Detail Recall method the average score was 0.44 points, which means they were in partial agreement with this method used for determining the awareness of design elements chosen. One of the main reasons for this is that the professionals believe that the memory ability of an individual person might affect the final result. Furthermore, it could be argued that an individual's memory is complex and cannot be explained in a single way. For example: they may have greater recall of elements that appear out of context, or those elements they have more opinion on. In addition, individuals might remember particular elements or spaces better due to the fact that they use the space regularly.

In relation to the Sketch Map survey, the professionals' opinion and their comments, the results are as follows. The average score was 2.22 points. Professional participants were agreed with this method used, as it could reveal more direct thinking from the elderly subjects, as opposed to the questionnaire. Indeed, they believe that the results can be further used to represent people's perception of space. Nonetheless, the participants argue that there are a few technical issues that can be applied in order to improve the method and gather more valid results. For example: some elderly subjects

may feel pressure when asked to display their drawing skills and, therefore, other recall techniques should be accepted as an alternative to only using drawing. This could be achieved by encouraging the subjects to use their own verbal description or written language to assist in their recall of the particular spaces.

In regards to the User-centred conversational tour method, the professionals' average score was 3.11 points. Indeed, they were agreed with the method used and believe that it is very useful and effective as it can yield more direct feedback from the elderly people without the need to recall from their memory. However, some interviewees highlighted one particular difficulty that could have significant impact on the resulting data. These professionals are of the opinion that elderly people are more likely to comment on things they dislike rather than those they like and, therefore, the information gathered is more likely to be negative. Nevertheless, this method could encourage individuals to think and speak in real situations and, thus, assist in gathering more in depth information from them. Overall, the professionals believe that the user-centred conversational tour is a more effective method than the questionnaire. They maintain that, this method does not require the subject to recall their memory in order to answer, as is the case with the use of a questionnaire where the design of the questions may contribute to directly influencing the elderly subjects' answers. However, in terms of "indirect method" the user-centred Conversational Tour may not be as effective as the other three methods (Visual Record, Detail Recall and Sketch Map) employed.

(4) Research result

This section explores the findings from questions 9 to 13, which asked about the research results obtained and the professional participants' agreement level and opinion.

The average agreement score for the Visual Record Survey was 2.89 points. This result demonstrates that 8/9 interviewees expected the result to be similar or the same. Additionally, more than 4 interviewees believe that the elderly subjects, when spending a long time in specific areas do so because they expect to use the area more often in the future.

On the results from the Detail Recall Survey, the average score was 2.44 (expect). The findings reveal that 8/9 interviewees expected the result to be similar or the same. In addition, 3 professionals believe the reason why flooring was nominated as the least important element was mainly due to the way people observe the space, which, in effect, is looking at eye level rather than looking down. For the Sketch Map the average agreement level was 2.89 points (agree). Again this result shows that 8/9 interviewees expected the result to be similar or the same. Furthermore, 4/9 interviewees believe the elderly subjects had a better recollection of the entrance area due to the fact that it was the first space they were exposed to and, therefore, they may pay more attention to it. In addition, 4/9 interviewees believe the reason elderly subjects had a greater recall of a particular space is because they used the space more often or they spent more time investigating while visiting the scheme.

The professionals were specifically asked about the results of the questionnaire given to the elderly subjects after the study, relating to the elderly subjects' priority of design elements and spatial areas within the research schemes. Firstly, then, the average agreement score for the priority of the design elements was 0.67 points (partially agree). These findings show that 6/9 interviewees were not surprised with the result. However, some had varying opinions on the priority of colour issues and they believe that colour was highly ranked due to its ability to invoke an immediate visual response and ability

to affect the atmosphere of a room, particularly as colour is evident in most of the interior area. In addition some professionals believe the reason lighting has a low priority is either because the elderly subject has a limited knowledge about it, or they are generally satisfied with the recent design.

Secondly, the findings of the professionals' expectations of the results from the elderly subjects' questionnaire on their priority of spatial areas the average score was 2 points (Not surprised). These results demonstrate that 8/9 interviewees expected the result to be similar. Moreover, 4/9 interviewees believe the results were directly related to the time the elderly subjects spent in each area. For example: elderly people spent more time in the common room lounge rather than other selected areas. Furthermore, some interviewees maintained the reason why shower room is at the bottom of list is because the elderly subjects would not use this space very often and, also that it would mainly depend on an individual's physical ability.

(5) Other

In order to acquire more information on real practices, the last question asked the professionals about their experience of how designers deal with budget limitations, particularly achieving the balance between design elements and spatial areas within a given budget. Therefore, what follows is an analysis of the design process in relation to budget (Figure 5.3, P.207).

It is normal that clients will carry out the research and provide the architectural firm with detailed information on what the end user requires and state budget limitations. Additionally, there will be certain building standards and regulations, especially the minimum size for particular spaces, which may have a significant impact on budgeting.

In situations such as sheltered housing schemes, the total amount of budget is usually dependent upon the number of occupants and how much they are able to pay for their residency. Therefore, by working out the budget for each occupant and how much space each individual actually needs, the monies left over may be used for the provision of common spaces.

For the next stage the designer collates all this information and uses their experience to divide the budget and create the design. Following this, when the architect

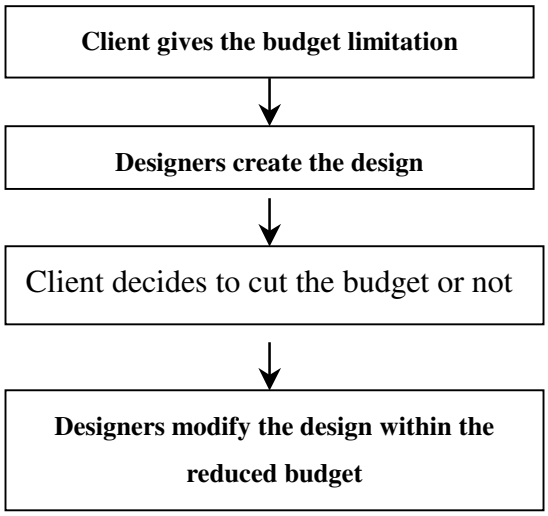


Figure 5.3. Professionals' experience of design process in relation to budget.

presents the final cost, the client decides whether to cut the budget or not. If a cut in budget is required by the client then the designer, based on their experience, will provide suggestions on how this can be achieved. For example: the budget could be significantly reduced by a decrease in the room size or by the use of cheaper building materials.

Furthermore, interviewees believe that the best way to divide budget is the

designer or architect working very closely with all stakeholders involved, including: client (building provider), building contractor and, in particular, the end user who is best able to contribute to effectively compromising the budget.

The final part of the interview, asked the professionals to give their opinion on the overall project and its future practical value. The average score, in this respect, was 2.44 points (agree). Moreover, the results reveal that 6/9 interviewees think the overall project is a sound methodological approach. Indeed, they believe by adopting a number of different methodologies a more valid and in-depth result may be achieved as people may respond differently from the various individual methods used. Accordingly, by making comparisons of the results from different methodologies a more accurate result could be achieved as opposed to the use of a single methodology. Furthermore, as the methods used in this research are very interactive, they can effectively, yield more information than would be the case for an interview or questionnaire approach. This may be due to the fact that the elderly subject's first reactions to an environment are in line with their subconscious feeling. However, one of the difficulties with this approach is that the process of research and the analysis of data can be considerably more time consuming than other research methods.

5.4 Conclusion

Initially, a comparison of the results, from the questionnaire survey, the Visual Record and Memory Recall methods, reveals the following. Firstly, regarding the priority of the selected spatial areas, the questionnaire and Memory Recall survey have similar outcomes and, secondly, the Visual Record survey and questionnaire appear to present slight differences in the resultant data. Nevertheless, the results indicate that the common room and entrance area were regarded as being more important than laundry, common kitchen and common shower room. Moreover, concerning the priority of the selected design elements, both surveys results of the Detail Recall survey and questionnaire reveal that the priorities were the same. “Colour” and “Furniture/equipment” were rated as first and second in importance and “Flooring" issues were rated by the subjects as the least important element.

The results from the questionnaire show that both the priority of selected spatial areas and design elements are similar to the results gathered from other methods used in this research. Therefore, this strongly suggests that the indirect methodology for gathering data, as used in this study, has definite potential in this particular context.

Furthermore, the results from the professionals’ interviews, concerning their opinions on the four different methodologies used, reveals that they regard the User-centred Conversational Tour as the most reliable method (average score of 3.11 points). The second most reliable is the Sketch Map Survey (average score of 2.22), followed by Visual Record Survey (average score of 1.78 points) and least reliable out of the four is the Detail Recall Survey (average score of 0.44) (Table 5.9, P.210). This may be due to the fact that too much bias, in a particular direction, could significantly affect the results. For example, regarding the Detail Recall survey, the elderly

Methodologies	**Average points**
User-centred conversational tour	**3.11**
Sketch Map Survey	**2.22**
Visual Record Survey	**1.78**
Detail Recall Survey	**0.44**

Table 5.9. Results from the professionals' interviews (reliability of methods used)

participants may be more likely to recall specific things they disliked rather than those they liked and, therefore, certain questions asked would have an adverse effect on the final result.

The results demonstrate that the professionals were more agreeable with those methods that were customized from established methodologies and have a solid theory rather than other methods used. For example: they were more confident with the User-centred Conversational Tour, as it was not only based on interview technique but also carried out in a real environment. In addition, some professionals suggested adding a follow up interview into the process after the Visual Record survey (Figure. 5.4). This would, effectively, clarify the subject's behaviour during the visit and help to identify

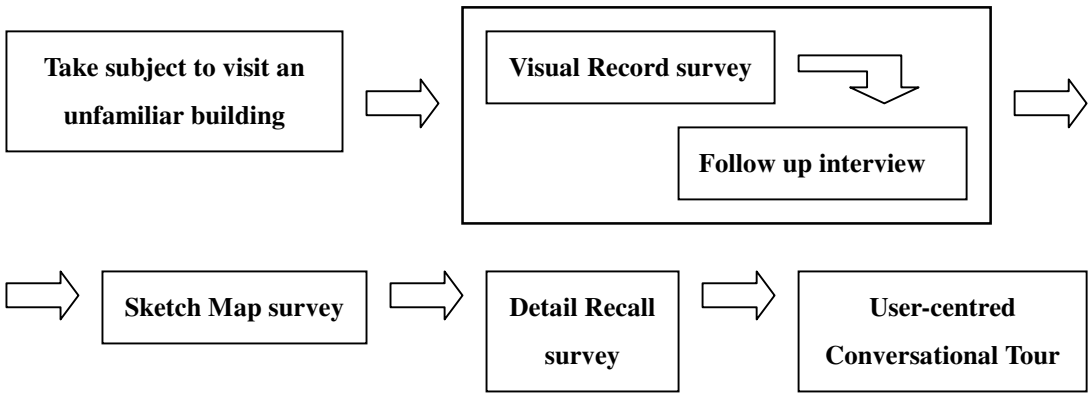


Figure 5.4. Outline of research process suggested by professionals.

the real motives behind the time they spent in each spatial area, thereby, contributing to a more accurate result.

Comparing the results from question 9 to 13, the professionals found it easier to predict the results of the Visual record and Sketch Map method (average 2.89 points) than they could predict the findings of the Detail Recall method (average 2.44 points). Moreover, these findings reveal that the professionals more successfully predicted the results, from methods used in this study, as opposed to the questionnaire. In addition, the result demonstrates that, with the questionnaire survey, professionals were more expectant of the results on the ranking of "spatial areas" (2.0 points) than they were of "design elements" (0.67 points).

Overall, the results reveal that the professional interviewees agree on the validity of the approach using different methodologies to collect evidence from the elderly subjects, in relation to their awareness of designs and spatial areas. The benefit of this approach is that it can prove or disprove the findings from each method used, filtering out the real answer and, thereby, facilitating a more accurate and reliable result. Furthermore, the results would be of more value than just the data from the interview or questionnaire, because it is people's first reaction and, therefore, more closely related to their subconscious feeling. However, the data analysis can be said to be considerably time consuming.

CHAPTER 6.

GENERAL DISCUSSION

6.1 Introduction

This chapter is a discussion of some of the key issues raised while carrying out this research. It also includes a summary of the difficulties and limitations with the methods used. It is divided into two sections. First, is the intra discussion (section 6.2) which explores each individual method used and the selections of the elderly subjects and professionals for the research evaluation. Second, is the inter discussion (section 6.3) which examines the connections between the methodologies used and, most importantly, the research findings inter methodologies, especially between indirect and direct approaches.

6.2 Intra discussion

6.2.1 Subject selection

(1) Subjects selection of elderly people

Because of the ethical and privacy issues, particularly within research involving elderly people, it is important that ethical considerations are implemented in every step of the research. Moreover, the complexities of the research methods used for this study, i.e. the application of four different methodologies, make the process more time consuming. Therefore, these considerations inevitably make it difficult to locate a willing or suitable subject for this study. Nevertheless, at the beginning of the research process, more than twenty letters were sent out to private sheltered houses and care homes around the Leicestershire area, asking them if any of their residents were willing to participate. However, none of the recipients responded, even when prompted with a second reminder letter. Thus, with the suggestion from supervisors, the researcher turned to specialist organizations for support. As a result, the Age Concern organization

suggested that the researcher should attend the Leicester city council's sheltered housing scheme open day, to see if they were able to assist with finding suitable candidates for the research. Consequently, after the third occasion attending the housing schemes open day, the researcher met with their department manager and provided an explanation of the research aims and its proposed outcomes. The housing manager proved to be very encouraging and agreed to support the project and help the researcher in finding subjects for the research.

Finally, the subjects were randomly selected from 15 different sheltered housing schemes, to effectively represent a broader group of people who live in council owned sheltered housing. However, some possible limitations have been identified, for example, the influence of residents' life experience prior to entering residential care and other issues related to personal attitudes and background. Therefore, these considerations have been excluded from this study. In addition, with the relatively small sample size of subjects, it could be argued that the results of this study have generic limitations. Indeed, there are many ways in which a sample can become unrepresentative and, potentially, the responses may cause bias in the research findings and analysis. Nevertheless, as the nature of this study was to apply multi-methodology to the context, the results obtained by the different techniques could provide a multi-view point via crosschecking of the various data. Thus, the intention of this approach is that it would assist in supplying evidence to reduce any limitations.

Furthermore, since women generally live longer than men, according to Office of National Statistics (2007) in the U.K. there are around 3 million and 976 thousand males and 5 million and 453 thousand females aged 65 and over. Dalley (2002) reveals that the scale between elderly males and females is about 1:1.37. For that reason, a female profile is

prevalent in both residential care and sheltered housing. More specifically, for the purposes of this study the scale between male and female is 1:1.6, which is close to the projection.

(2) Subject selection of professionals

The whole project was focused on an interior design perspective and aimed at discovering some improved methods to be used for determining elderly peoples' perception of the interior environment. Essentially, it was hoped that this research would better inform the future design of sheltered housing. Consequently, it was deemed important to consult participants with the relevant professional background and qualification, in order to provide an effective evaluation to the study.

Accordingly, there were about fifteen letters sent out to architecture firms or interior design companies and senior university lecturers who are also employed with interior design companies. The recipients were asked if they were willing to take part in the research and provide constructive input. Eventually nine professionals expressed an interest in the research and agreed to take part. These included four architects, five interior designers with an average of seventeen years experience and at least seven years practice in an architecture or interior design discipline.

Moreover, in order to obtain the best results from the interview, a brief statement about the whole research project and its process, coupled with the actual questions they would be asked in the interview, were sent out to each participant by e-mail. This was primarily done to enable the professional participants to have a clearer view of the project and would provide them with sufficient time to think about their responses and opinions before the interview date.

6.2.2 Research methods

The Institute of Housing and Royal Institute of British Architects (1988), advise that tenant participation in the design process cannot be ignored and moreover, listening to the voices of service users, including elderly people, was integral to the 1990 National Health Service and Community Care Act. Therefore, the basis of this study was to enable residents themselves (in this case, elderly people) to make a definite contribution to the improvement of their own physical environment (sheltered housing) by examining significant experiences and giving prominence to the voices of older people. Furthermore, as the average length of any participant's stay in sheltered housing was six years, most respondents were very familiar with the design characteristics and gave valuable information, which would contribute greatly to the project.

In addition, because the research participants were elderly people, ethical issues dictated that the researcher should be sensitive and demonstrate particular consideration when designing the research methodology. The benefits are that this would make the participation more elderly-friendly and be an enjoyable as possible process for them.

Finally, it should be stated that there were some difficulties experienced through the use of a multi-method approach. With several methods of data collection, the time taken to prepare the studies and analyse the data, on completion, far exceeded the time taken to conduct the research. However, this may be due to the methodology being relatively new and, also, the lack of an established research procedure protocol. Nevertheless, as one of the research aims was to develop a multi-methodological approach, the overall results could help to eliminate some of the difficulties by establishing a research design protocol for future researchers interested in the use of a similar methodology for their projects.

6.2.2.1 Visual Record survey

The aims of the Visual Record survey were to discover how the elderly observe unfamiliar spaces and their priorities in relation to the defined five individual spatial areas. In order to achieve this, a device called Visual Witness glasses (VW glasses) were designed and constructed by the author and utilised to record the real time video. However, unknown to the researcher, at the same time a similar device had been created and used for marketing research by ID Magasin a shopping behaviour specialist. This device was named "Eye Contact" and provided an objective measurement on the effectiveness of advertising. Participants wore this device to record all the promotional advertising that they were exposed to. An analysis of the advertisements and their effects could then be made from the video evidence. Therefore, the device and method used in this research cannot be strictly called a new methodology. However, the adoption of this device and method, in practice, becomes the best and most effective reference for this kind of study. And it can still be regarded as a new methodical approach, in the field of interior design, to obtain reliable data from the elderly subjects and enable an understanding of how they observe and investigate an unfamiliar space.

Nevertheless, the information gathered from the Visual Witness glasses was more complicated than the researcher anticipated. It proved difficult to calculate how much time subjects spent on different design elements as some elements were situated close to each other. Furthermore, from the recorded video image, the researcher was unable to satisfactorily identify exactly what the subject was looking at. Therefore, the video information was more effectively utilised to calculate how much time subjects spent on different space areas along with aspects of their visiting behaviour. The recordings were also efficient in identifying the elderly subjects' awareness of the space areas, within the

scheme, and the particular behaviour they displayed while observing these unfamiliar spaces.

In addition, the researcher's expectations were that some differences, between the subjects on the routes they chose to visit, would become apparent, particularly as some of the elderly subjects may be more interested in viewing a specific area rather than the entirety of the building complex. However, the results confirm that most subjects only walked around the building following the direction of the corridor and back to the starting point. One possible reason might be related to the layout of the buildings. These were either in a letter L or T shape and all had long curved corridors without intersections. Therefore, it is a logical process to walk along the corridors and view the individual space areas in sequence rather than moving from one point to another without any order. Another possibility for this logical process might be because the scheme is an unfamiliar environment for the elderly subjects and, with safety in mind, by following the route of the corridor they will be prevented from becoming lost. Furthermore, the video record provides a facility for the retrieving of data for repeat examinations. Additionally, there are some factors which might significantly affect the results. One possible cause of major bias is the size of individual areas, with scales of size in each area on average as follows: 4 (Common lounge): 1.5 (Entrance area): 2 (Laundry): 1 (Common Kitchen): 2.5 (Common Shower room). However, the behaviour observed during the visit provides more solid evidence which support the results and therefore helps to mitigate this bias.

Another bias which was highlighted by professionals from the interview was that the elderly subjects might spend more time on a specific item that has special design features or colours, therefore, attracting the subjects attention, more so than the

functional importance they may or may not attach to the item. Nevertheless, some of this bias can be reduced by observing the subject's behaviour during the visit and, further, by the questions asked or their conversation during the visit. Accordingly, the professionals suggest that any apparent difficulties can be clarified by holding an interview after the Visual Record survey is completed. This could be achieved by reviewing the recorded video and asking the elderly subjects about the reasons behind their attention to particular elements. Potentially, this enquiry could establish if the space meets the practical and / or emotional needs of the subjects and, thus, each space could then be categorised.

Moreover, some professional participants argue that the equipment used may directly affect the elderly subjects behaviour, as they may be generally more suspicious about technology and, therefore, the camera device employed in this research could make them feel like they are being watched. However, in the actual research situation, the researcher found that as the device was small and light in weight, by giving the subject a few minutes to get accustomed to it, prior to the recording, they were able to function with no undue difficulties. Consequently, throughout the survey, none of the elderly subjects made negative reference to the comfort and overall experience of wearing the device. On the contrary, from the author's observation, the subjects appeared to enjoy the process during their visit by using the camera device and felt that they were contributing to something useful that would promote with the improvement of current interior design.

6.2.2.2 Detail Recall survey

As human memory is complex there are many factors which can affect an individual's recall. Moreover, Lawson (2001) suggests that the commands of our attention and what we remember about places depends as much upon ourselves as on the physicality of the objects and places themselves. Therefore, as the methods of this research all rely on the subjects' recall of the environment, there may be some bias evident which might affect the results of the Detail Recall survey. Additionally, one of the major biases, highlighted by schema theory (Anderson 1984), suggests that the things we remember are directly influenced by what we already know. The theory argues that people's intention is to recall what they expect to see and remember objects that are typical, normal, and consistent with the currently active schema, more so than objects that do not fit the schema. On the other hand, many researchers indicate that very noticeable objects were more likely to be recalled (Cohen 1989). No matter which of these theories is more convincing, they can both be said to have some influence on the final outcome of the research. Thus, it is suggested that the adoption of different approaches to collect evidence on elderly people's awareness of design elements provides more reliable data.

In addition, the researcher found that some elderly subjects felt a certain degree of pressure and appeared nervous while doing the survey, as they were afraid of giving the wrong answers. However, this situation improved considerably after the researcher reiterated the aim of the methodology, which was not to test their memory ability but to identify what details they recalled.

6.2.2.3 Sketch Map survey

- **General discussion**

Millar (2006) states that when using drawing as methodology procedure, the major difficulty is that the drawing not only relies upon the orientation ability of the individual, but also on their drawing skill and ability, and in some cases, their memory ability. In this research, most subjects were uncomfortable with drawing as an output media. Many expressed the opinion that they couldn't draw, while others felt the need to emulate architects and draw plans that were as accurate as possible. In order to overcome difficulties concerning the participant's drawing skills and make their drawing easier to analyse, the author believed that some examples of basic drawing symbols could be shown to subjects before conducting the survey. This would, at least, provide the participant with some basic knowledge of what may be required. However, Rovine (1989) referred to Golledge who specified that to control participants' cartographic knowledge or skills, could confound attempts to measure or categorize the exact information contained in the sketch maps and therefore affect the final result. Besides, as there were the limitations of time scale and the varying learning abilities between subjects, this option may take a significantly long time to achieve. Therefore, in order to avoid any such bias the researcher decided not to offer the participants any assistance with their drawing skills. Nevertheless, the researcher assisted with this apparent difficulty by encouraging the subjects to use other recall techniques to aid their drawing. Indeed, some elderly subjects used words instead of the symbol or shape of the elements in the drawing (Figure 6.1, P.222). Moreover, the narrative information in this process was recorded on digital video, thereby, providing the research with extra information to review.

In addition, to reduce any bias in the assessment of results, on the priorities of the selected spatial areas, drawings were ranked not only by the researcher, but also by an architect experienced in space design planning. The results were recorded as averages and used to demonstrate the findings.

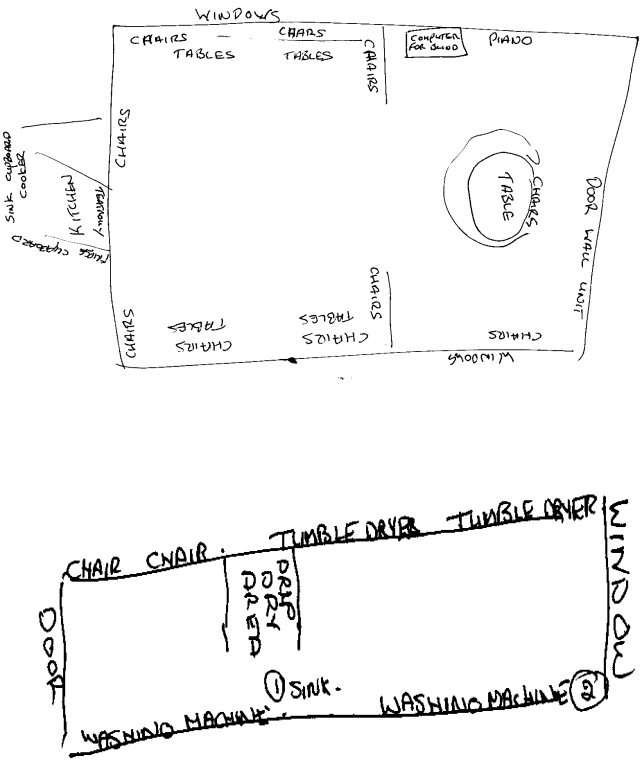


Figure 6.1. Example of 2 subject's drawing by used words instead of the shape or symbol of the elements in the drawing. By Sue & Joyce

However, the most difficult part of the project was the analysis of the elderly subject's drawing as representing their perception of space, as it is subjective and does not possess a standard to measure the meaning of each drawing. Therefore, it could be argued that the results are effectively dependent upon the researcher's understanding of the drawing and experience. Hence, the outcome could be slightly different if analysed by another researcher. Moreover, the research reveals that people can more readily draw an area by area from their memory, but have less recollection in order to competently draw the whole building layout.

■ Drawing pattern

The subjects were asked to produce drawings of each of the selected areas in both

their own scheme and the visited scheme entirely from memory. The results were used to serve as representations of their perception of the spaces. Overall, the subjects completed eighty different drawings. In this section the collection of drawings will be presented and comparisons made of their drawing pattern.

When subjects were asked to produce a drawing of the whole building, most felt it was difficult to recall where each individual space was located in the building and therefore, struggled to produce an accurate drawing. Moreover, most of the subjects had little recollection of the layout and location of each selected space area in the visited scheme. In addition, a small number of the subjects could actually point out where each space was located within their own scheme but were unable to achieve this accuracy in relation to their pictorial record of the visited scheme. For example Sue is quite adept at recalling the layout of her own scheme. However, her recollection of the visited scheme is quite limited, as she explains that she can only remember the corridors leading to the various spaces and that the building layout was quite complicated (Figure 6.2, P.223). Nevertheless, when it comes to the drawings of each individual area, the subjects displayed a much better recollection of the layout and details inside.

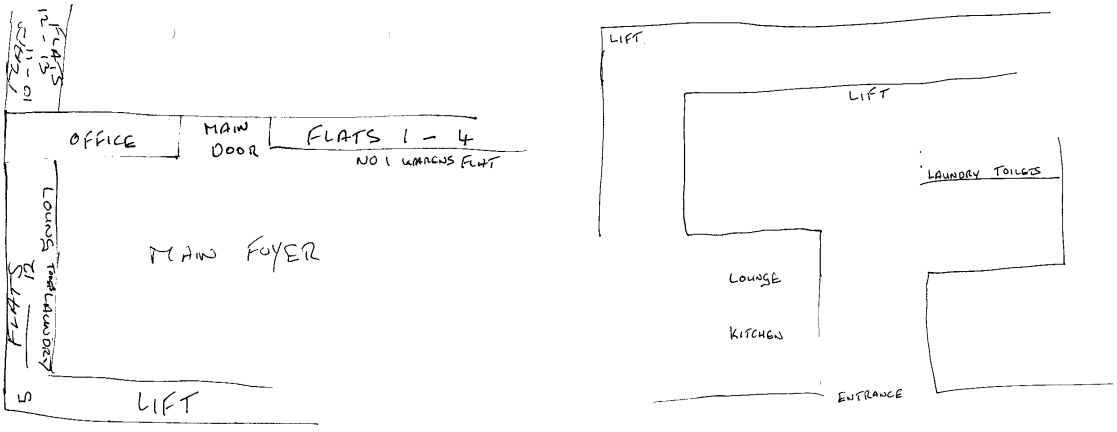


Figure 6.2. Example of drawing of layout of building (Her own scheme Left & visited scheme Right) by Sue

Looking at the participants' drawing in general, revealed quite diverse drawing styles. Most illustrations used basic shapes to identify different areas or furniture represented by squares, circles and lines. However, most commonly, they employed written words to label the items they drew (Figure 6.3). This may be due, in part, to the fact that they had little knowledge of the different symbols used in professional drawing and also that they lacked confidence in their drawing skills.

Observation of the participants in the drawing process shows that most commenced their drawings by outlining the main door (entrance) followed by an illustration of the shape of the immediate space and then filling in the furniture situated along the internal wall. Others continued this process by starting from some identical or special items such as: book shelf, piano, pool table etc. which would have easily attracted their attention. In addition, most subjects used dotted lines or written labels to indicate the location of the doors and windows.

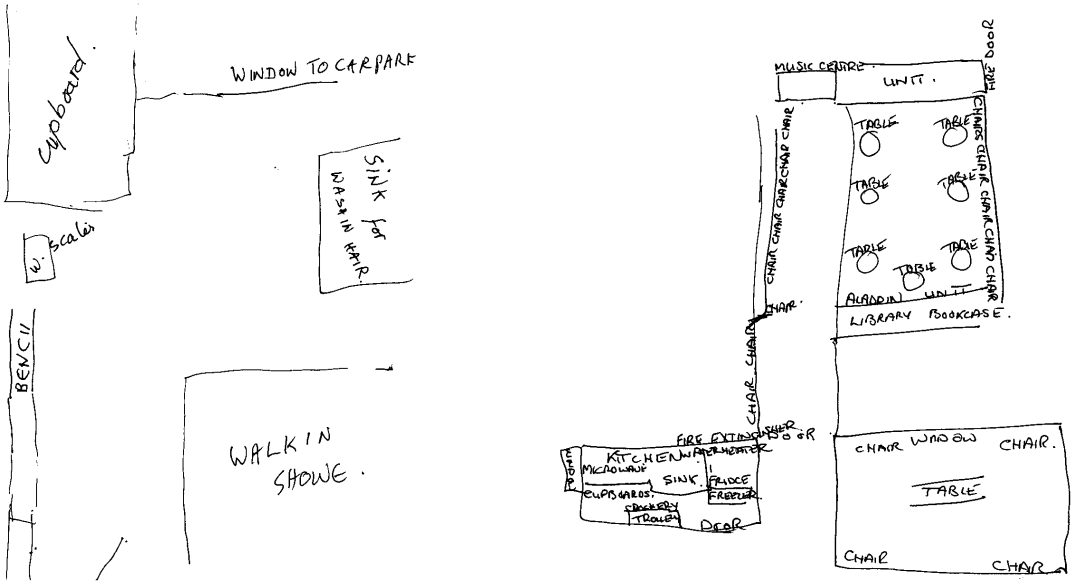


Figure 6.3. Example of 2 subject's drawings by using words with shapes to represent the elements in the space. By Yvonne & Joyce

As each drawing was based on the individual's experience of the space, a close study of each participant's drawing can readily pick out the similarities between subjects. For example: most participants had a greater recollection of their own building, compared with that of the visited scheme. This process, therefore, assists with recognising what the space design represents to the individual and also their perceptions to the space. However, the visual complexities involved in representing the subject's awareness of selected items such as lighting, colour, decoration and flooring cannot be adequately expressed by using such a method. Nonetheless, these limitations can be overcome, to some degree, with support from the Detail Recall survey. This method was used to determine the participant's awareness of these selected elements and, therefore, would provide the information required to support the findings from the Sketch Map. Accordingly, by combining these two methods, the priority of the selected spatial areas within the scheme would be affirmed and moreover, would reveal the subject's perception toward it.

6.2.2.4 User-centred Conversational Tour

This method was adapted from research by Millar (2006) who used the "Conversational Tour" as a process whereby participants are actually taken to the place of research and encouraged to explain themselves and express their feelings about this environment, in context. As the method requires participants to react in a real site, especially in the field of interior or architectural design, the potential is that, it can provide more in-depth information than any other method. However, as previously highlighted, the design of the interview questions might affect the elderly subjects' responses. Therefore, to facilitate a more open forum in this research, the author asked

the subjects to express their feelings about each individual space area, without asking specific questions but encouraging the subject to lead the conversation. Furthermore, the elderly subjects were afforded sufficient talking time in order to freely express themselves, thereby, enabling a much less biased end result. Also, in addition to analysing what the participants' say, the verbal information was identified and coded with the selected design elements to calculate their level of satisfaction with each selected spatial area. This would help to indicate the particular spaces and elements that require improvement or modification and, also be used to improve current space design. Additionally, a substantial amount of information was gathered from the survey and these findings provided strong evidence of subjects' personal responses to their physical environment, which, it is may be argued, cannot be established by using direct methods involving conventional interview techniques. It was also apparent that, throughout the survey, the subjects appeared to talk more about physical aspects rather than emotional feedback about the space, which may suggest that the elderly subjects were not used to describing their feelings in front of others or on camera. Moreover, most professional participants contend that this method can encourage elderly people to think and to speak and, therefore, produce more detailed information.

6.2.2.5 Questionnaire

In order to make the questions clear and avoid any confusion for the elderly subjects, each question was divided into sub-questions. For example, instead of asking the subjects to prioritise all items together from 1 to 8, a list of items was set out at the beginning of each question followed by individual questions such as "which element do you think is the second most important to you from the listed items". The main reason

for this approach was to avoid any misunderstanding which might lead to the elderly subjects entering the same number for different items, as they may think the question is asking them to provide a rating[27] for each item instead of prioritising[28] them.

The original eight elderly subjects were asked to fill in the questionnaire and the results were analysed. However, it is important to make the results clearer on the priority of each spatial area or element without repetition. Indeed, results on the priority of the selected design elements (Table 6.1.) show that the colour and space arrangement are both rated as priority 3 and the Mode[29] number related to the furniture/equipment was priority 4, 5 or 7. Therefore, to enable a more accurate result, more respondents were required. To achieve this, residents from Frederick Jackson House were chosen for the survey. In total there were 24 questionnaires gathered for analysis. The results (Table 6.2, P.228) show more clearly the priority of design element without repetition, therefore, providing more reliable and valid evidence.

	Alan	Patricia	Sue	Joyce	Pops	Yvonne	James	Norma	Mode	Proportion
room size	1	1	1	6	2	1	1	1	1	6/8
layout of space	2	4	2	1	1	2	7	2	2	4/8
colour	4	3	4	5	7	3	2	3	3	3/8
decoration	6	5	6	7	5	4	6	8	6	3/8
lighting	7	6	7	2	8	5	5	4	5or7	2/8
furniture/equipment	5	8	5	4	4	7	3	7	4,5or7	2/8
space arrangement	3	2	3	3	3	6	4	5	3	4/8
flooring	8	7	8	8	6	8	8	6	8	5/8

Table 6.1. Questionnaire results on the priority of the selected design elements (8 subjects)

[27] Rating: evaluation or assessment of the selected items that, in terms of quality and the number, may be repeated.
[28] Prioritising: the order provided relates to their level of importance.
[29] The most frequently occurring value in a set of discrete data

	Alan	Patricia	Sue	Joyce	Pops	Yvonne	James	Norma	S9	S10
room size	1	1	1	6	2	1	1	1	1	1
layout of space	2	4	2	1	1	2	7	2	2	2
colour	4	3	4	5	7	3	2	3	4	6
decoration	6	5	6	7	5	4	6	8	5	7
lighting	7	6	7	2	8	5	5	4	6	5
furniture/equipment	5	8	5	4	4	7	3	7	8	3
space arrangement	3	2	3	3	3	6	4	5	3	4
flooring	8	7	8	8	6	8	8	6	7	8

S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	Mode	Proportion
2	1	3	1	3	1	2	1	1	3	1	2	1	1	1	16/24
1	2	2	2	1	2	3	2	3	1	2	1	2	3	2	13/24
4	4	4	3	4	4	1	4	2	4	4	4	4	4	4	14/24
6	7	7	7	7	8	7	7	5	7	7	6	8	7	7	11/24
7	8	1	8	6	6	8	6	8	5	6	7	6	6	6	8/24
5	5	6	5	5	5	6	5	6	6	5	5	5	5	5	12/24
3	3	5	4	2	3	4	3	4	2	3	3	3	2	3	12/24
8	6	8	6	8	7	5	8	7	8	8	8	7	8	8	14/24

Table 6.2. Questionnaire results on the priority of the selected design elements (24 subjects)

6.2.2.6 Interview with professionals

It should be acknowledged, here, that the interview took longer to proceed than the author's original plan. This whole process took around two months to complete, which includes the initial preparation and the actual interview with the professional participants. The reason for the length of this delay was that the participants had other working commitments and the interview had to be held either in the early morning, before they started work, or be carried out in their lunchtime. Nevertheless, each interview was, on average, about one to one and half hours in duration. Due to the significant amount of data produced, the author spent a considerable period of time translating the verbal information into text for further analysis.

To analyse the gathered data and translate it into statistical information, narrative

answers from each professional were transcribed into individual sentences then rated by the author, according to the level of agreement. However, as the decision to choose the level of rating attributed to each sentence was made by author himself, without other reference, the data became subjective and may have created a bias. For that reason, all the professionals' narrative data was rated by the author at the same time on the same day to minimise any potential bias from possible changes in the researcher's personal opinion of the rating, particularly if this was carried out on different days. Thus, the results remain valid. Furthermore, the author believes that with some extra resource, such as employing professionals with experience in the analysis of narrative information, could have proved beneficial when analysing the data.

In addition, the author experienced some degree of pressure when conducting the interview with the professionals, as their opinion was going to be used to evaluate the research and also, as they have considerable experience in design related fields they might have different opinions to the researcher's own conclusions. Nevertheless, the whole process has run quite efficiently, and the professional participants have provided some useful feedback about each method used as well as other suggestions, all of which are detailed in chapter 5 (research evaluation) and 7 (recommendations for future study).

6.3 Inter discussion

6.3.1 Connection between methodologies

This research involves three distinct types of data collection methods with the participants, in an attempt to gain more accurate insight into their perceptions of space. Each individual method could be utilised independently or employed collectively to enable cross checking the results on the elderly subjects' awareness of the selected space areas and interior design elements.

It can be seen that the Detail Recall and Sketch Map methods are closely related to each other, in that they require input from the participants' memory recall of both the detail design elements and spatial layout and arrangement of each area. Also, the results of these methods make clear which space areas or elements the elderly subjects paid particular attention to. Accordingly, from both the Visual Record and Sketch Map survey the results illustrate that the time participants spent on investigating each individual space could be directly related to their memory of a specific area. For example: the results from the Visual Record survey reveal that participants spent more time in investigating the common room area rather than other selected spaces. Likewise, the Sketch Map survey results show that participants had a better recollection of the common room than other selected spatial areas.

6.3.2 Results between different methodological approaches

The intention of this section is to compare the results from the different methodologies used, with particular attention paid to the differences between these methods. More specifically, this section is concerned with comparisons between direct and indirect methodologies. The function of the indirect method is to determine that the

information is acquired without the participant being privy to the aims behind the research. This indirect methodology is contained within the Visual Record, Detail Recall, Sketch Map surveys and part of the User-centred Conversational Tour (quantitative analysis method). Conversely, the direct method allows the participant to know exactly what the question is concerned with and is represented in the questionnaire and part of User-centred Conversational Tour. Discussion of the results from the different methods and possible explanations behind the results are set out below.

6.3.2.1 Awareness of selected spatial areas

When comparing the results from the two indirect methods used (Visual Record survey and Memory Recall survey) on five selected areas, the results were very similar. Results from the Visual Record were: 1.common room 2.entrance area 3.laundry 4.common kitchen 5.common shower; and result from the Memory Recall survey was: 1.entrance area 2.common room 3.laundry 4.common kitchen 5.common shower room and the only difference evident was the order of priority 1 and 2 (common room and entrance area). One possible explanation for the entrance area being selected as first priority, from the Memory Recall survey, was that the elderly subjects were able to remember more element's detail than the common room, due to the fact that the design of entrance area was simpler than the common room, therefore, enabling the subject to recall more easily. In addition, it is clear that from the Visual Record survey, all subjects paid more attention to the common room lounge than entrance area while they were visiting the scheme. Moreover, from the Memory Recall and Visual Record surveys, the results confirm that the subjects paid less attention to the common kitchen and common shower as they took less time to investigate these areas or simply, that they remembered

less about the spaces.

Priority	Entrance area	Common room	Common room kitchen	Laundry	Common shower room
Visual Record Survey	2	1	4	3	5
Sketch Map Survey	2	1	4	3	5
Detail Recall Survey	1	2	4	3	5

Table 6.3. Result from three different method approaches.

Furthermore, when comparing the time subjects spent in each area, with the data collected from the subjects' memory recall (Table 6.3.), it is evident that the time period spent in the space might also influence the subjects' memory of the space. This is especially relevant to the results from the Sketch Map survey. In addition, the results reveal that the size of the individual space had no significant affect on the results as the elderly subjects spent more time on smaller spaces if they were interested in these spaces.

In comparing these results with those from the direct method (questionnaire) reveals similar findings. The subjects chose entrance area as priority 1 and common room as priority 2 and common shower room as the least important area within the scheme.

Additionally, these results also demonstrate that the subjects' previous accommodation and physical ability could affect their perceptions of the space. For example: some subjects, having moved from a three-bedroom house, felt the size of the scheme to be extremely small. However, others who had moved from a one-bed bungalow were more impressed and expressed satisfaction with the proportions of the

scheme.

Furthermore, the results from User-centred Conversational Tour (Table 6.4) reveal the priority of the improvement needed for the selected design elements in relation to the selected spatial areas. For example: the size of the entrance area is the first priority expressed as needing improvement, as it is placed at the lowest satisfaction level by the elderly subjects. Indeed from the qualitative result, most subjects believe that this space is too small.

Areas		Categories of Design Element								
			A	B	C	D	E	F	G	H
		Level of satisfaction	63.64%	73.33%	74.19%	53.85%	78.57%	67.74%	75.00%	50.00%
	Order of satisfaction level		6	4	3	7	1	5	2	8
Entrance	5	46.88%	33.33%	50.00%	44.44%	50.00%	66.67%	50.00%	N/A	42.86%
Comon room	1	80.30%	91.67%	88.89%	100.00%	62.50%	85.71%	50.00%	80.00%	66.67%
common kitchen	4	52.17%	28.57%	100.00%	100.00%	N/A	N/A	75.00%	100.00%	N/A
Laundry	2	77.47%	83.33%	50.00%	62.65%	N/A	100.00%	85.71%	N/A	N/A
shower room	3	57.14%	66.67%	N/A	N/A	N/A	50.00%	83.33%	N/A	N/A

Categories of Design Elements:

A: Room Size E: Lighting
B: Layout of space F: Furniture/equipment
C: Colour G: Space arrangement
D: Decoration H: Flooring

Table 6.4. Results from User-centred Conversational Tour.

6.3.2.2 Awareness of design elements

The results acquired concerning the elderly subjects' awareness of the five selected design elements in the Detail Recall survey show that the subjects recall greater detail of the colour scheme rather than other design elements, followed consecutively by, furniture, lighting, decoration and the least recalled detail was flooring. Within this method, the results were recorded as an average between recall of the participant's own scheme and the visited one. As subjects spent less than 20 minutes looking around the

building of the unfamiliar scheme, this suggests they were able to instantly memorise elements as they originally saw them. However, in simple terms, the results show that the participants had a greater recall of their own scheme (Table 6.5- M1) compared with the results from the visited scheme (Table 6.5- M2), which was expected by the author. It is, therefore, apparent that the results of the Detail Recall indicate this method is essentially reliable.

Finally, while the results revealed a difference in priority, flooring was still seen as the least memorable issue. However, as a qualitative study, the results can only be taken as a single piece of design evidence. In addition, a comparison of the results with the ordinary questionnaire survey on the five selected design elements reveals the same result as Detail Recall survey.

Design element asked	% of correct answers	% of correct answers (M1)	% of correct answers (M2)
Colour	72.50%	97.50%	47.50%
Decoration	56.25%	80.00%	40.00%
Lighting	63.75%	95.00%	32.50%
Furniture/Equipment	67.50%	82.50%	52.50%
Flooring	52.50%	80.00%	25.00%

M1: Results from their own scheme
M2: Results from visited scheme

Table 6.5. Result from Detail Recall survey.

Moreover, combining the results from the Detail Recall survey with the User-centred Conversational Tour (Table 6.4, P.233), reveals the priority which selected spatial areas require most improvement. For example, the results on the quantitative data from the UCCT survey show that with the colour scheme, the elderly subjects are least satisfied with the building entrance area and, therefore, would recommend immediate improvement. More specifically, the qualitative data informs us that the

reason for their dissatisfaction was they felt the colour scheme in the building entrance area made the immediate environment dark and uninviting. Thus, the elderly subjects expressed that brighter or lighter colours would be preferable. For the second priority, "furniture and equipment", the subjects believed that more improvement in the building entrance and common room area was required. Their contention was that many items were out of date and there were insufficient numbers of these items, considering the amount of residents in the scheme. Moreover, a comparison of these results with findings from the questionnaire demonstrates that subjects have a better recollection of those elements they view as important and are least likely able to recall elements they care less about.

6.3.2.3 Discussion of research findings

- **Priority of selected spatial areas**

The results on the priority of the five selected spatial areas from the different methods are discussed below (Table 6.6, P.236):

The results obtained from the Visual Record survey with support from the subjects' visiting behaviour were as follows: 1. common room 2.entrance 3.laundry 4.kitchen 5.shower. Memory Recall survey priorities were: 1.entrance area 2.common room 3.laundry 4.common kitchen 5.common shower room. The results from the questionnaire on selected spatial areas were as follows: 1.entrance area 2.common room 3.laundry 4.kitchen 5.shower room. Finally, results from the professionals' expectation

on the subject's priority of the selected spatial areas were as follows: 1.common room 2.laundry 3.entrance area 4.shower room. The common Kitchen was rated as priority 2 or 3.

Priority	Entrance area	Common room	Common room kitchen	Laundry	Common shower room
Visual Record Survey	**2**	**1**	**4**	**3**	**5**
Memory Recall survey	**1**	**2**	**4**	**3**	**5**
Questionnaire	**1**	**2**	**4**	**3**	**5**
Professional's expectation	**3**	**1**	**2 or 3**	**2**	**4**

Table 6.6. Results on the priority of the five selected spatial areas from four different methods.

A Comparison of the findings of the different approaches showed that the results from the Memory Recall survey and questionnaire were the same. Also comparing these results with the Visual Record survey reveals that the only apparent difference was between priority 1 and 2. However, the score between entrance area (5.69) and common room (5.66) were very similar. From the questionnaire survey, some participants stated that the reason they rated entrance area as first priority was mainly because they thought it was important to establish a more welcoming atmosphere for the visitor. Therefore, these results lead the author to believe that as a functional space, the common room appears to be more important for the elderly subject's daily life. However, as an emotional and functional space, it is the appearance of the interior of building entrance area that becomes an important issue for the elderly people.

Furthermore, a comparison with the results from professional's expectation, showed

that they have different expectations from those of elderly people. Nevertheless, results concur in relation to common kitchen and shower room, which were rated as the least two areas of importance respectively for the elderly subjects. Most professionals said that they ranked the selected spatial areas based on the elderly subject's day to day usage of the space. For instance, the common shower rooms were mainly used for guests or residents without the capacity to use their own showers. Therefore, because the professionals thought most of the residents in the scheme were quite active and independent, this is the reason that common shower room was deemed a low priority.

In addition, results show that both the Visual Record and Memory Recall surveys provided more evidence to support the findings, by including their behaviour (time spent and attitude), as well as their memory recall of the space. However, with the questionnaire survey alone, there is no other evidence provided, apart from the participant's answers from test. Therefore, these findings appear to have less value and may require a much larger number of respondents in order to robustly support the evidence.

- **Priority of selected design elements**

The results on the priority of the five selected design elements from different methods are discussed below (Table 6.7, P.238).

The results from the Detail Recall survey reveal the following order of priority: 1.colour scheme 2.furniture/equipment 3.lighting 4.decoration 5.flooring, which were in line with the results from the questionnaire. Nevertheless, the professionals did have slightly different expectations for the priority which were as follows: 1.furniture/equipment 2.lighting. Flooring was rated as priority 4 or 5, colour scheme

was rated as priority 3 or 5 and decoration was rated as priority 2 or 3 or 4 or 5.

However, two of the interviewees thought that the possible reason the professionals and elderly people prioritise the selected design elements differently was because they had different requirements. On one hand, the first priority for the designer is to create a safe environment and consider the functionality of the space. On the other, the priority for the elderly people might be the appearance of the interior spaces or other personal preferences

Priority	Colour scheme	Furniture / Equipment	Lighting	Decoration	Flooring
Detail Recall Survey	**1**	**2**	**3**	**4**	**5**
Questionnaire	**1**	**2**	**3**	**4**	**5**
Professional's expectation (Interview questionnaire)	**3 or 5**	**1**	**2**	**2,3,4 or 5**	**4 or 5**

Table 6.7. Results on the priority of the five selected design elements from three different methods.

In addition, the results from the professionals' questionnaire demonstrates that, with only limited participants, this may, possibly, contribute to a high repetition of the same priority, compared with the questionnaire for elderly residents with a higher proportion of participants. However, the Detail Recall survey reveals that, even with a limited response, the results correlate precisely with the findings of the questionnaire concerning the selected design elements. Therefore, this suggests that the Detail Recall survey and questionnaire could be combined to provide further evidence, rather than just relying on the participants' answers.

6.4 Conclusion

This chapter has examined and discussed some important issues raised within the research. It also explores some of the difficulties and limitations with the methodologies used.

The basis of this study was to assist elderly people themselves to make a definite contribution to the improvement of their own physical environment by examining significant experiences and giving prominence to the voices of older people. The ethical issues became a major consideration in every step of the research. Furthermore, the investigation was carried out as a privately funded PhD study without any sponsor or organisation in support, making it even more difficult in the search for suitable participants. Fortunately, following the author's repeated approach to the Leicester Housing Department, the housing manager showed interest in the research and agreed to support the project and assist the researcher in finding suitable participants.

It should be stated that there were some difficulties experienced through the use of a multi-method approach. With several methods of data collection, the time taken to prepare the studies and analyse the data, on completion, far exceeded the time taken to conduct the research. For example, the video recordings gathered from the Visual Record survey were more complicated than the researcher had expected, in that it was time-consuming in identifying the subjects' awareness of the selected spatial areas and their behaviour. There were further difficulties with this research. As each participant had different preferences for which day to conduct the research, the planning of the time schedule meant there was a delay in the commencement of the research. In addition this delay was affected by ethical issues as the author was required to ask the Leicester Housing Department to inform the residents living in the block where the research was

to take place one week before the research commenced. The reason for this was to show consideration for the elderly residents in the same building and that they would not be unduly disturbed in the process. A similar situation affected the evaluation interviews. As the professional participants had other working commitments, it took a very long period to reschedule the interview time. However, the whole interview was run quite efficiently, and the professional participants have provided useful feedback about each method used as well as other relevant suggestions. Besides, very little relevant research had previously been carried out using the same techniques, particularly those methods used for analysing participant's perceptions of the space involving verbal information, drawings and behavioural issues as their perception of space. Therefore, it could be argued that much of the analysis of this information was experimental and may be viewed as being subjective.

Moreover, compared to the methods used with questionnaire (Table 6.8, P.242), the Visual Record survey tends to provide more evidence to support the findings, including both the time subjects spent in each individual area and their behaviour within the space, as revealed by the video record. However, it should be acknowledged that the analysis of the gathered information is time consuming. In addition, the method for analysing the Visual Record survey data is, effectively, subjective. Nevertheless, this bias could be considerably reduced by conducting a follow up interview, with the participants to review the video and, therefore, help to identify the motives behind their behaviour. In regards to the sketch Map and Detail Recall survey, these have the advantage of avoiding the bias of the interference from participant's attitudes toward the research topic and any affects resulting from the questionnaire design. Nevertheless, there are some apparent disadvantages here, particularly as the analysis of the drawing

	Advantages	Disadvantages
Visual Record	■ Provides more hard evidence e,g. support from video recorded (behaviour along with time spent in each area).	■ Time consuming ■ Method used for analysis is subjective.
Sketch Map	■ Indirect (passive) approach without affects of participants' attitudes or interviewer's questions.	■ Time consuming. ■ Method used for analysis is subjective. ■ Relies on single evidence.
Detail Recall	■ Indirect (passive) approach without affects of participants' attitudes or interviewer's questions.	■ Relies on single evidence.
User-centred Conversational Tour	■ Without the need for subject to imagine or recall their memory to provide the answer. ■ Provides visual and audio information for further analysis.	■ Time consuming.
Questionnaire	■ Requires less time to achieve results. ■ Less ethical issues.	■ Relies on single evidence. ■ Requires large quantity of subjects to acquire better results. ■ Participants' attitude could affect the results. ■ Need subject to imagine or recall their memory to get the answer.

Table. 6.8 Comparison on 4 different methods with Questionnaire.

is time consuming and that both methods rely on single evidence. Furthermore, the User-centred Conversational Tour can be seen to provide information on the subject's perception of the space without the need for them to imagine or recall the answers from their memory. In addition, the video record provides information for repeated examination. However, compared with the questionnaire, the research process of the Conversational Tour requires considerably more time to complete. Nonetheless, as a multi-methodological study, the results from different methodologies were used to support each other, therefore, ensuring more reliability.

Furthermore, as previous research has not shared similar aims, it becomes much more difficult to validate the research results on the priority of selected design elements and spatial areas. Therefore, the questionnaire and interview with the professionals appear to be the most effective methods to evaluate the results. Additionally the results acquired from both the direct and indirect methodology approaches are very similar and only have some minor difference, therefore, providing validation of the indirect approach employed in this study. For instance, results gained from the questionnaire survey reveal that participants selected "colour scheme" as their first priority. Similarly this is one of the design elements best remembered, by each participant, from the Detail Recall survey. Therefore the findings shows that people do remember better those elements they deem as important and tend to forget elements they showed less interest in.

From the questionnaire, results demonstrate that participants chose common room lounge as the most important space for them. Indeed, this is the area where participants spent most of their time investigating, as demonstrated by the results of the Visual Record survey. Other evidence from the Visual Record survey concurs with that of the

questionnaire. Hence, the Visual Record shows the common shower room as the space where the elderly subjects spend the least time and, similarly, this has been selected as the least important space from the questionnaire survey. In relation to details in the environment, results from the Detail Recall survey also reveal that subjects recalled more detail of the common room and the least amount of detail of the shower room. Therefore, the findings illustrate that, while investigating an unfamiliar space, elderly people intend to spend more time on the space they think is more important to them and because of that, they are more readily able to remember the detail of the environment.

Furthermore, the researcher made informal enquiry of the subjects concerning their feelings and opinions on the various methods used within the research. Most of the elderly subjects expressed that they had enjoyed participating in the research. In particular, some thought that the Visual Record and Sketch Map survey were very interesting as they saw them as different from other methods they were aware of. More importantly, they could see that their involvement may, potentially, contribute to the future design of sheltered housing.

CHAPTER 7.

CONCLUSIONS AND RECOMMENDATIONS

This study made investigations into elderly people's perceptions of sheltered housing space by employing multi-research methods that placed elderly people at the centre of the research. The main intention was to attempt to assist the design development of interior space more effectively and efficiently by involving the end users more directly within the design process; by giving them the opportunity to communicate their perceptions of their living space by appropriate means. It is suggested that the elderly should be regarded as knowledgeable on the subject of their own experiences of space and be seen as capable of expressing these experiences. Consequently, the use of a multi-method approach appears to give best insight into the elderly persons' experience, particularly as methods employing face-to-face contact are most preferred by elderly people (Thornton 2000). The researcher was aware of this preference and approached the study with a similar protocol.

More specifically, it is considered that the employment of an indirect method could possibly limit any influences affecting an individual's attitude towards the research topic as is evident with a more direct methodology. In other words, an indirect approach would help to avoid the situation where elderly participants offer a more favourable response to any research questions, particularly as they may supply the researcher with answers they believe the researcher wants to hear, while at the same time suppressing their own true feelings and opinions.

The research indicates that a meaningful dialogue and consultation with elderly people about their experience of using space, would help better inform the design decision making at all stages. Such a forum could be utilised to provide the designers with a useful guide to the elderly persons' perceptions and to identify their likes and

dislikes, by means which are both relevant and appropriate to them. This highlights the fact that the development of a friendly methodology of working with elderly people, would facilitate a better understanding of their needs.

Literature research indicates that a good housing design can effect a considerable reduction in care and health costs (Bridge 2007) and, ultimately, achieve a significant improvement in the quality of life and well-being of an individual. This is particularly relevant in relation to the welfare of elderly citizens. Since the ageing process brings on the gradual degeneration of the body, their performance in later life may at times be deficient. With these changes they become more sensitive and increasingly rely on certain aspects of their environment to assist them. It is important, therefore, that housing providers have a good understanding of elderly peoples' requirements for supportive environments which compensate for those abilities that have been damaged or have deteriorated. Accordingly, the methods implemented within this thesis offer insight into the perceptions of elderly people and provide us with relevant and valuable information concerning their requirements.

The research to date has provided an understanding of elderly persons' perceptions of recent sheltered housing design and their spatial design preferences. Results from the Visual Record survey reveal that, while visiting the unfamiliar scheme, the elderly subjects spent more time exploring the common room and with the least amount of time spent in the shower room. Aided by the video recorded during the visit, the elderly subjects' behaviour and attitude towards each individual area were used as evidence to support the findings. The results were summarised as the priority of the spatial areas to the elderly subjects, as well as their perceptions toward each individual

area. In addition, this provides a list of priorities for improvements required and, also, reveals the most suitable areas that could be developed to enhance contemporary spatial design. Moreover, results concerned with the participants' behaviour, throughout the visit to the unfamiliar building, demonstrate that the relation between the interior space and outdoor environment plays a significant role for the elderly. Therefore, the effective positioning of windows, relative to external views is identified as a potential key design issue.

Comparing the outcome of the Memory Recall survey reveals similarities concerning the order of priority of the spaces as identified by the elderly respondents. In both of these methods the elderly subjects remember more detail element and space arrangement related to the entrance area and common room, but recall less on the common shower room. The resultant data from the Detail Recall method also demonstrates that the elderly subjects recalled more detail on the design elements of the colour scheme and furniture/equipment but had a more limited recollection of the detail on flooring. The evidence was taken as prioritising those design elements that elderly subjects paid particular attention to. Moreover, the subject's drawings presented more insight into their perceptions of each selected interior space. However, it is apparent that the method used to analyse the meanings of the drawings needs to be developed further, particularly as there are limited sources of related literature available that would help to define a standard to measure the meanings of each drawing.

Nevertheless, the findings from the User-centred Conversational Tour have provided an understanding of elderly persons' perceptions of the sheltered housing space design. It has revealed their spatial design preferences and, thus, provides a

checklist for future design or improvement of the sheltered housing scheme. In addition, the results demonstrate the elderly subjects' level of satisfaction with each selected spatial area.

Overall the research highlights that the elderly subjects paid more attention to the common room and entrance area, when considering the five different identified areas within the sheltered housing schemes. Moreover, the evidence gathered within the study also suggests that colour and furniture/equipment are the most essential elements from the five selected design elements within those spaces. Therefore, the results could be used to establish budget priorities. Consequently, these results should certainly be considered, particularly in the modification of recent residential environments.

It could be argued that the results of this study have generic limitations because of the relatively small sample size of subjects and buildings visited. However, the fact that the results gathered via different methods on elderly people's awareness of space areas and design elements are very similar, strongly suggests that this indirect technique of information gathering has definite potential in this particular context. Moreover, the combination of the methods allow for a greater understanding of the elderly people's perceptions of recent sheltered housing, enabling those findings to be compared. In addition, further research with larger groups of elderly subjects is required to test the reliability and validity of the results and data collection methods. However, the methodologies employed were generally successful and have the potential to provide those within the field of interior design with tools to help building providers understand the experience of their users, particularly elderly people, to a greater degree. Hence, it was important that the results of this research were reported back to the elderly subjects,

as this may serve to encourage their future involvement.

To evaluate the research methods used and their findings, nine professionals from an interior or architectural background were selected for interview. Comparing their opinions on the use of the four different methodologies, the interviewees concluded that the User-centred Conversational Tour was the most reliable method, followed by the Visual Record Survey, then the Sketch Map Survey and least reliable out of the four was the Detail Recall Survey. These particular results demonstrate that the professionals were more likely to agree with a method that was customized from ordinary methodology backed up by a solid established theory rather than with other methods used.

Overall, from the results, it can be seen that the interviewees are of the opinion that the methods used are very interactive. They maintain that an approach with different methodologies to collect evidence on the elderly subjects' awareness of design elements and spatial areas is essential. Indeed, this can prove or disprove the findings from each method and, hence, filter out the less reliable data and provide more accurate results. In addition, some professionals suggest that the opinions from sheltered housing officers or other related staff could be useful if included in the study.

Furthermore, to develop the applied methodologies, some suggestions from the professionals could be taken as possible additions for the improvement of future study. In order to provide a clearer understanding of the participant's behaviour and their attitudes toward each individual area, some professionals suggest that an interview, following the Visual Record survey, would be effective. By reviewing the recorded video, the subjects could then be asked the reasons behind their attention to particular

spatial areas or elements. For instance, they could be questioned on why they spend more time in a particular area. Ultimately, this would go some way into improving the findings.

In addition, as this research presents different indirect methodologies working together and is able to help identify more in depth information on people's perception of interior space, it could be applied to different age groups or buildings to discover if there are any disparate behavioural issues between such groups.

Moreover, statistics reveal that, the size of the elderly population in the UK is anticipated to rise over the coming year and its profile is expected to change. In particular, there are expectations of significant increases in the proportion of older people from black, Asian and minority ethnic groups from the current 12% rising to 23% by the year 2021 (Vegeris et al. 2007). Thus, some may argue, that there is potential for a language or cultural barrier resulting in the misunderstanding of interview questions and difficulties in acquiring the true feelings of the individual. Furthermore, adopting the methods of this research may contribute to influencing the consistency and definitiveness of the findings. Therefore, it is important that this multi-method approach should also take into consideration and be used to gather the views and experience of a variety of ethnic groups and, more importantly, promote the implementation of recommendations beneficial to these members of society. Furthermore, whether in real or virtual space, we form cognitive maps to deal with and process the information contained in the surrounding environment (Billinghurst and Weghorst 1995). Thus, the methods used in this research could be taken further and adapted to evaluate three-dimensional models or virtual reality environments that are

often used in the interior design field to demonstrate design ideas. Furthermore, it should also be pointed out that most of the participants expressed that they had greatly enjoyed participating in the research and that their close involvement at the centre of the research made them feel they were making a valid contribution.

Finally, then, it is important to clarify the main achievements in terms of the aims and objectives of this research. These are as follows:

The original contributions:

The methodology employed, particularly the Visual Record method, has been used here for the first time in order to investigate peoples' behaviour in an interior design discipline. Moreover, the unique combination of both qualitative and quantitative methodologies used for this analysis, provide wider evidence to support the findings. The implications are that these findings can be adapted to the field of interior design to assist building providers in more fully understanding the experience of their users, particularly elderly residents. Indeed, this thesis adds to existing research on elderly people's experience of interior environment by providing a detailed account of the spatial perceptions of sheltered housing within the UK.

Achievement

By accomplishing the research objectives, the following aims have been achieved:

- The results demonstrate that the use of a multi-method approach appears to reveal best insight into the elderly person's experience. In particular, the indirect method can be very effective in limiting any influences affecting an individual's attitude towards the research topic, as is evident with a more direct methodology. More

specifically, the Visual Record survey proved efficient in identifying the elderly people's awareness of the space areas by providing strong evidence with aspects of their visiting behaviour. Therefore, the methodologies adopted can be deemed successful by providing those with both the information and tools to enable more effective design projects.

- The methodologies implemented within this thesis offer insight into the perceptions of elderly people and provide us with relevant and valuable information concerning their requirements. Moreover, the results acquired relating to the elderly people's priority of the selected spatial areas suggest that elderly subjects paid most attention to the common room and entrance area. In addition, colour and furniture/equipment are revealed to be the most essential elements within the sheltered housing schemes. Consequently, the design and positioning of these specific areas and elements should be considered crucial, particularly in the modification of recent residential environments.

However, it should be conceded that, in relation to the design of interior spaces, there is still much to learn, to review, and to experiment with in order to discover the most effective and desirable ways to involve older people. Nonetheless, it is clear that there is a definite requirement for more research in order to provide a greater understanding of elderly persons' perceptions of space and that this would, potentially, lead to the provision of more satisfactory environments for them to inhabit and enjoy.

REFERENCES

& BIBLIOGRAPHY

REFERENCES

Age Concern (2005), Housing, [WWW] Avalable from: http://www.ageconcern.org.uk/AgeConcern/ABE28CAF2E0B4E9FBF02FDBAFD762DB6.asp?TextSize=medium [Accessed 7/6/05].

Anderson, R. C. (1984). Role of the reader's schema in comprehension, learning, and memory. In R. C. Anderson, J. Osborn, & R. J. Tierney (Eds.), Learning to read in American schools: Basal readers and content texts. Hillsdale, NJ: Lawrence Erlbaum Associates.

Barker, J., Bullen, M. and de Ville, J. (1999), Refreance Manual for Public involvement. Bromley Health, London, West kent Health Authority, Lambeth, Southwark and Lewisham Health Authority.

Berkun S. (2004), Programmers, designers and the Brooklyn Bridge. [WWW] Avalable from: http:// www.scottberkun.com/essays/essay30.htm [Accessed 26/02/08].

Bate P. and Robert G. (2006), Experience-based design: from redesigning the system around the patient to co-designing services with the patient, Quality and Safety in Health Care, 15, pp 307 - 310.

Best J. (1999), Cognitive psychology (fifth edition), Wadsworth Publishing company, California.

Billinghurst M. and Weghorst S. (1995), The use of sketch maps to measure cognitive maps of virtual environments, Virtual Reality Annual International Symposium Proceedings, p.p. 40-47.

Birren E. (1959), Principles of research on aging, in Birren E., (Ed.) Handbook of aging and individual, Chicago, University of Chicago Press.

Black A. (2006), The basic of user centre design, [WWW] Avalable from: http://www.designcouncil.org.uk/en/About-Design/Design-Techniques/User-centred-design-/ [Accessed 20/12/06].

Blades M. (1990), The reliability of data collected from sketch maps, Journal of environmental psychology, Vol. 10, pp327-339.

Blenkner, M. (1967), Environmental change and the aging individual, The gerontologist, Vol. 7, pp. 101-5.

Bradburn N., Sudman S. and Associates (1980), Improving interview method and questionnaire design, London, Jossey-Bass Publication.

Branch L., Horowitz A. and Carr C. (1989), The implications for everyday life of incident self-reported visual decline among people over age 65 living in the community, The gerontologocal society of america, vol. 29, 3, p.p.359-366.

Bridge C. (2007), Housing and Disability: a great opportunity, Centre for Housing Research, [WWW] Avalable from: www.chranz.co.nz/pdfs/housing-disability-commentary.pdf [Accessed on 18/5/08]

Bromley B. (1988), Human aging. An introduction to gerontology. 3rd eddition. Harmondsworth, Penguin.

Burnett A. (2005), In the right place, accessibility, local service and old people, London, Help the Aged.

Burns A. (1995), cause of death in dementia. In Murphy E. and Alexopoulos G. (ed.), geriatric psychiatry, key research topics for clinicians. Chichester, Wiley.

Burnside I. (1986), Demography and aging, In Burnside I. (ed), Working with the elderly- group process and techniques, Jones and Bartlett Publishers, Boston, USA pp.2-19.

Caine D, Lyness M., King A. and Connors A. (1994), Clinical and etiological heterogeneity of mood disorders in elderly patients. In Schneider S., Reynolds D., Lebowitz B. and Friedhoff J., (eds), diagnosis and treatment of depression in late life. Washinton, American psychological Association.

Care and repair England (2007), Older people and housing related facts and figures, [WWW] Avalable from: www.careand repair-england.org.uk, [Accessed on 14/5/07].

Carr S. and Schissler D. (1969), The city as a trip: perceptual selection and memory in the view from the road. Environment and behaviour, vol. 1, pp 7-35.

Carter T., Beresford P. (2000), Age and change, models of involvement for older people, York, Joseph Rowntree Foundation.

Cavanaugh J. and and Fields F. (2006), Adult development and aging, London, Wadsworth Thomson Learning.

Centre for Accessible Environments (CAE) (1998), Health Facilities Note 19 (NFN 19) The design of residential care and nursing homes for older people, NHS Estates Department of Health.

Ching, F. (1987), Interior design illustrated, New York, Van Nostrand Reinholc.

Cohen, G. (1989), Memory in the real world, Lawrence Erlbaum Associates Ltd., East Sussex.

Collingsworth J. and Rehahn A. (1993), Design for disability: a handbook for students and teachers, London, Guildhall University.

Corso F. (1981), Aging sensory systems and perceptio n. New York, Praeger.

Counsel and Care (2007), Extra care housing, [WWW] Avalable from:

http://www.counselandcare.org.uk/assets/library/documents/30_Extra_care_housing.pdf [Accessed on 15/8/07].

Cowan N. (1995), Attention and Memory - An Integrated Framework, Oxford, oxford university press, Psychology series 26.

Currey, D, Brear K and Zioupus, P (1996), The effects of aging and changea in mineral content in degrading the toughness of human femora. Journal of Biomechanic, 29, 257-260.

Dalley G. (2002), Independence and autonomy- the twin peaks of ideology. In Sumner K. Ed., Our homes, our lives- choice in later life living arrangement, Centre for Policy on Ageing, London. Pp 10-25.

Day C. (2004), Spirit and Place, Oxford, Architectural Press.

De Montfort University (2004), Ethical issues in Human Research, [WWW] Avalable from: http://www.dmu.ac.uk/research/regs_and_procedures/P_4_Research_Ethics.jsp

[Accessed on 15/3/04].

Department of Economic and Social Affairs, United Nations Population Division (2004), The 2004 Revision of World Population Prospects, [WWW] Avalable from: http://www.un.org/esa/population/publications/WPP2004/2004EnglishES.pdf?bcsi_scan_5CBBA20D813A2009=0&bcsi_scan_filename=2004EnglishES.pdf , [Accessed 14/9/06].

Department of Health (2003), Guidance on National Assistance Act 1948 (Choice of Accommodation) Directions 1992, [WWW] Avalable from:

http://www.dh.gov.uk/en/Consultations/Closedconsultations/DH_4071450, [Accessed on 20/11/04].

Downs R. and Stea D. (1973), Cognitive map and spatial behaviour: process and products. In Down R. and Stea D. Eds., Image and environment, Chicago, Aldine publishing Co., pp8-26.

Easton V. and Mc Coll J. (1997), Statistics glossary, University of Glasgow. [WWW] avalable from: http://www.stats.gla.ac.uk/steps/glossary/presenting_data.html, [Accessed on 24/9/05].

Evans, G. and McCoy J. (1998), When buildings don't work: the role of architecture in human health, Journal of Environmrntal psychology, Vol. 18, p.p. 85-94.

Farkas S and Hoyer J. (1980), processing consequences of perceptual grouping in selective attention, Journal of Gerontology, 35, pp 207-216.

Fast J. (1971), Body language, London, Pan books.

Fozard, J. L. (1990), Vision and hearing in aging. In J. E. Birren and K. W. Schaie (Eds.), Handbook of the psychology of aging (3rd ed., pp. 150-171). San diego: academic press.

Georgia Tech's College of Computing (2006) Human memory, [WWW] Avalable from:

http://www.cc.gatech.edu/classes/cs6751_97_winter/Topics/human-cap/memory.html, [Accessed on 4/05/07].

Gifford R. (1988), Light, décor, arousal, comfort and communication, Journal of environmental psychology, Vol. 8, pp.177-189.

Gillham B. (2005), The research interview, London, Continuum.

Golledge R. (1976), Methods and methodological issue in environmental cognition research. In Moore G. and Golledge R. Eds., Environmental Knowing, PA. Dowden, Hutchinson and Ross.

Green I. (1975), Housing for the elderly: the development and design process, London, Van Nostrand Reinhold.

Guardian (2005), Shopper's eye view of ads that pass us by, [WWW] avalable from: http://www.guardian.co.uk/media/2005/nov/19/advertising.marketingandpr [Accessed on 12/12/07].

Hackney R. and Waddington D. (1988), Tenant participation in housing design- A guide for action, Institute of housing and royal institute of British architects (RIBA) publication limited, London.

Hamilton I. (2006), The psychology of Ageing, Jessica Kingsley Publishers. London.

Hartwell D. (1998), Creative thinking, In the proceedings of the Third International Conference on Creative Thinking, Malta University Press.

Heerwagen J. (2004), Psychosocial Value of Space, [WWW] Avalable from:

http://www.wbdg.org/design/psychspace_value.php?r=promote_health-i, [Accessed 14/6/05].

Hodges R. (2000), Memory in the dementias. In Tulving E & Craik M. (eds.), the oxford handbook of memory, New York, Oxford University press.

Holahan, C.J. (1978), Environment and Behavior, Plenum Press, New York, NY.

Housing care organisation (2004), sheltered housing or retirement housing, [WWW] Avalable from:
http://www.housingcare.org/making-elderly-housing-choices/sheltered-or-retirement-housing.aspx, [Accessed on 10/8/04].

Housing Care organization (2006), Guide to housing and care options for older people, [WWW] Avalable from: http://www.housingcare.org/, [Accessed on 7/6/06].

ID Magasin (2007), New marketing research tool measures advertising effectiveness objectively, [WWW] Avalable from:

http://www.newscientist.com/article.ns?id=dn5015 [Accessed on 12/12/07].

Improvement and development agency (IDeA) (2006), Why bother? Improving the quality of life for older people, the older people's shared priority. [WWW] avalable from: http://www.idea.gov.uk/idk/core/page.do?pageId=1 [Accessed 22/2/06].

Institute for Family-Centred Care (2006). [WWW] Avalable from: http://www.familycenteredcare.org [Accessed 26/2/06].

James W. (1983), The Principles of Psychology, Cambridge, Mass. Harvard University Press.

Johnson L. (1978), That was your life: a biographical approach to later life, in Carver V. and Liddiard P. (Eds) An aging population, Sevenoaks, Kent, Hodder and Stoughton.

Kaplan, S. and Kaplan R. (1982), Cognition and environment. New York, Praeger Publishers.

Kausler H. (1982), Experimental psychology and human aging, New York, John Wiley and Son.

Kellaher, L. A. (1986), Determinants of quality of life in residential settings for old people. In Judge, K. and Sinclair, I (eds), Residential care for elderly people. Her Majesty's Stationery Office, London. Pp.127-137.

Kermis D (1983), The psychology of human aging: theory, research and practice. Boston, Allyn and Bacon.

Kitchin R. (1994), Cognitive maps: what are they and why study them, Journal of environmental psychology, Vol. 14, pp1-19.

Kuller R, Ballal S., Laike T., Mikellides B. and Tonello G. (2006), The impact of light and colour on psychological mood: a cross-cultural study of indoor work environments, Ergonomics,Vol. 49, 14, p.p. 1496-1507.

Lang J. (1993), Creating architectural theory: the role of the behavioral sciences in environmental design. New York, Van Nostrand.

Lawson B. (2001), The language of space, Architectural Press, Oxford.

Lawton, M. (1982) Competence, environmental press and the adaptation of older people, in M. Lawton, P. Windley and T. Byerts (eds) Aging and the Environment, Theoretical Approaches, Springer, New York.

Lee, D., Chen, R., Hartwell, D., Chen, K. (2006), A Study on Elderly Persons' Perceptions of the Interior Environments of Sheltered Housing Scheme in the UK. In Proceedings of the 13th Annual Conference of the Ergonomics Society of Taiwan, Taiwan, p99.

Leibrock, C. (2000), A design details for health: making the most of interior design's healing potential, John Wiley & Sons,Inc., New York.

Leicester City Council Sheltered Housing Department (2005), Home front [WWW] Available from: http://www.housing.leicester.gov.uk/homefront/index.asp [Accessed 24/11/05].

Light L. and Zelinski E. (1983), Memory for spatial information in young and old adults, Developmental psychology, Vol.19, p.p.901-906.

Linton H. (1999), Color in architecture: design methods for building, interiors, and urban spaces. New York, McGraw Hill.

Longman dictionary of contemporary English (1995), third edition, p1048, Essex, Longman Group Ltd.

Mahnke F.and Mahnke H., (1987), Color and light in man-made environments. New York, Van Nostrand.

Malim T. (1994), Cognitive processes, The Macmillan Press Ltd, London.

Manser, M. (1989), The architecture of institutions for demented persons. In Wertheimer, J., Baumann, P., Gaillard, M. and Schwed, P. (eds), Innovative Trends in Psychogeriatrics, Karger, Basle.

Marsh, G. (1980), Perceptual changes with ageing, In Busse, E. W. and Blazer D.G. (Eds) Handbook of geriatric psychiatry, New York, Van Nostrand Reinhold.

Markson, E. and Cumming, J. (1974), Social consequences of physical impairments in an ageing population, The Gerontologist, Vol. 9, p.p39-46.

Millar J. (2004), But what are we saying to our kids? In Proceedings of the 6th International Symposium for Environmental Behaviour Studies, Tian-Jin, P. R. China, p.p278-284.

Millar J. (2006), An investigation into children's perceptions of architecture space in schools, PhD thesis, University of Dundee.

Miller S. and Schlitt J. (1985), Interior Space, New York, Praeger Publishers

Ministry of Housing and Local Government and the Welsh Office, (1969), Housing standards and costs: accommodation specially designed for old people, Circular 82/69, HMSO, London.

Moor G. (1975), The development of environmental knowing: an overview of an interactional constructivist theory and some data on within individual developmental variations. In Canter D. and Lee T. (eds.) Psychology and the byuilt environment. London: Architectual Press. New York: Wiley, pp. 184-194.

Nasar J. (1981), Responses to different spatial configurations. Human factors, Vol. 23 (4) pp 439-446.

National stastic, (2007), Population aging, [WWW] Available from: http://www.statistics.gov.uk/cci/nugget.asp?ID=949 [Accessed 18/11/07].

Neisser U. (1967), Cognitive psychology. New York, Appleton-Century-Crofts.

Netten A. (1993), A positive environment? Physical and social influences on people with senile dementia in residential care, Ashgate Publishing Ltd, Aldershot, England.

NHS Institute for Innovation and Improvement (2007), NHS Institute involvement framework [WWW] Avalable from: http://www.institute.nhs.uk/building_capability/general/involvement_framework.html , [Accessed on 23/6/07].

NHS Institute for Innovation and Improvement (2007a), Experience Based Design, [WWW] Avalable from: http://www.institute.nhs.uk/quality_and_value/introduction/experience_based_design.html [Accessed on 23/6/07].

Norman D. (1976), Memory and attention-an introduction to human information processing, John Wiley & sons Inc., New York.

Parker C., Barnes S., Mckee K., Morgan K., Torrington J. and Tregenza P. (2004) Quality of life and building design in residential and nursing homes for older people, Ageing and society, Vol. 24, pp.941-962.

Passini R. (1984), Spatial representations, a way finding perspective, Journal of environmental psychology, Vol.4, p.p. 153-164.

Patmore, C., Qureshi, H. and Nicholas, E. (1999), Tuning in to feedback, community care, 24-30 June, pp. 28-9.

Pennartz, P. (1986), Atmosphere at home: a qualitative approach. Journal of environmental psychology, Vol. 6, p.p. 135-154.

Proudlock F., Shekhar H. and Gottlob I. (2004), Age-related changes in head and eye coordination, Neurobiology of Aging, Vol.25, pp 1377-1385.

Puff C., (1982), Handbook of research methods in human memory and cognition, London : Academic press p.p.270.

Rabbitt, P (1990), Applied cognitive gerontology: some problems, methodologies and data. Applied cognitive psychology, 4, pp 225-246.

Rabbitt, P. (1988), Social psychology, neurosciences and cognitive psychology need each other, The psychologist, 1, 12, pp 500-506.

Radley, A. and Taylor, D. (2003), Remembering one's stay in hospital: a study in recovery, photography and forgetting. health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine, 7 (2), p.p129-159, 2003.

Rich M., Lamola S, Gordon J and Chalfen R. (2000), Video intervention / prevention assessment: a patient-centered methodology for understanding the adolescent illness experience, Journal of Adolescent Health, 27 (3), p.p55-165.

Riseborough M. and Jones A. (2005), Assessing quality of life in specialist housing and residential care, York, Joseph Rowntree Foundation.

Rodstein, M., Savitsky, E. and Starkaman, R. (1976), Initial adjustment to a long-term care institution: medical and behavioural aspects, Journal of American Geriatrics Society, Vol. 24, pp. 65-71.

Rosen D. and Purinton E. (2004), Website design: viewing the web as a cognitive landscape, Journal of business research, Vol.57, pp 787-794.

Rovine M. and Weisman G. (1989), Sketch-map variables as predictors of way-finding performance, Vol.9, p.p.217-232.

Royal Commission on Long Term Care (1999) With Respect to Old Age. Report of the Royal Commission on the Funding of Long Term Care for the Elderly, London: The Stationery Office.

Sadalla E. and Oxley D. (1985), The perception of room size: the rectangularity illusion. Environment and behaviour, Vol. 16, (3), pp 394-405.

Salthouse T. (1982), Adult cognition-an experimental psychology of human aging, Springer verlag, new your.

Salthouse, T.; Mitchell, D. (1990), Effects of age and naturally occurring experience on spatial visualization performance, Developmental Psychology. Vol 26, pp 845-854.

Sanoff, H. (2005) Verbal conversation at EBRA (Environment behaviour research association) 2005 conference, Tianjin, china.

Sealy, A. (1998), The design of residential care and nursing homes for older people, Leeds, NHS Estates Department of Health.

Schaie K. and Willis S. (2002), Adult development and aging, London, Prentice Hall International.

Seargeant, J. and Steele, J. (1998), Consulting the public: guidelines and good practice. London, policy studies institute.

Sherman, R., & Craig, A. B. (2003). Understanding virtual reality: Interface, application, and design. San Francisco, CA: Morgan Kaufmann Publishers.

Sirgy, J., Grewal, D., Mangleburg, T. (2000), "Retail environment, self-congruity, and retail patronage: an integrative model and a research agenda", Journal of Business Research, Vol. 49, p.p127-38.

Silverstein, M., and zablotsky, D. (1996), Health and social precursors of later life retirment-community migration. Journal of Gerontology: social Sciences, 51B, S150-S156.

Sorensen, S. and Brunnstrom, G. (1995), Quality of light and quality of life : an intervention study among older people. Lighting Research and Technology, 27, 2, pp 113-121.

Stevens, C., Cruz, A., Hoffman M. and Patterson, Q. (1995), Taste sensitivity and aging: high incidence of decline revealed by repeated threshold measures. Chemical Senses.

Stokes G. (1992), On being old – the psychology of later life, London, The Falmer Press.

Sommer, R. (1969), Personal space. Englewood Cliffs, NJ: Prentic-Hall Inc.

Spencer C. and Dixon J. (1983), Mapping the development of feelings about the city: A longitudinal study of new residents' affective maps, Transactions of the Institute of British Geographers, New Series, Vol. 8, pp. 373-383.

Sundstrom, G. (1994), Care by families: an overview of trends. Social Policy Studies, No. 14, 15-55. Paris, France: OECD.

Suzman R., and Riley W. (1985), Introducing the "oldest old.", Milbank Memorial Fund Quarterly: Health and Society, 63, 177-185.

The Consumer Focus Collaboration (2001), The evidence supporting consumer participation in health, [WWW] Avalable from: http://www.participateinhealth.org.au/clearinghouse/#E [Accessed on 24/3/06].

The College of Computing at Georgia Tech (2006), The Senses, [WWW] Available from: http://www.cc.gatech.edu/classes/previous.html, [Accessed 4/05/07].

The Stationery office (2000), The Building Regulations 2000, access to and use of buildings approved document M, The Stationery office.

Thornton P. (2000), Older people speaking out, developing opportunities for influence, York, York Publishing Services.

Tinker A. (1999), Aging in place: what can we learn from each other, Ecumenical Housing Inc., North Caulfield.

Trompenaars, F. and Hampden-Turner, D., (1997), Riding the waves of culture: understanding cultural diversity in business, London, Nicholas Brealy.

United Nations Population Division (2007), World population aging 2007 [WWW] available from: http://www.un.org/esa/population/publications/WPA2007/wpp2007

.htm [Accessed 30/5/08].

Underwood G (1976), Attention and memory, Oxford, Pergamon press.

Uttal H (2000), Seeing the big picture: map use and the development of spatial cognition. Developmental science, 3, pp247-286.

Valins M. (1988), Housing for the elderly- a guide or architects, interior designer and their clients, London, Architecture Press.

Vegeris S., Barnes H., Campbell-Barr V., Mackinnon K. and Taylor R. (2007), Engaging older citizens, a study of London boroughs, London, Policy Studies Institute.

Webb D. and Weber J. (2003), Influence of sensory abilities on the interpersonal distance of the elderly, Environment and behavior, Vol. 35, pp.695-711.

Wechsler, D (1972), “Hold” and “don’t hold” tests. In S. M. Chown (ED), Human ageing : selected readings. New york, penguin.

West, R., Crook, T., and Barron, K., (1992), Everyday memory performance across the life span: Effects of age and non-cognitive individual difference. Psychology and aging, Vol. 7, 72-82.

West R., Murphy J., Armilio L., Claik M. and Stuss T. (2002), Effect of time of day on age differences in working memory. The Journal of gerontology series B, Psychological sciences and social science, 57, pp.3-10.

Whole Building Design Guide (WBDG) Productive Committee (2004), Promote Health and Well-Being, [WWW] Available from: http://www.wbdg.org/design/resource.php?cn=1.18&cx=0&rp=49&submit.x=12&submit.y=9 [Accessed 22 Dec. 2004].

Williams K. and Trubatcha D. (1993), Nursing home care for the patient with Alzheimer's disease : an overview, Maryland, Lippincott Williams & Wilkins.

Windmill V. (1990), Aging today- a positive approach to caring for elderly people, Edward Arnold, London.

Wittels, I. And Botwinick, J. (1974) Survival in relocation, Journal of Gerontology, Vol. 29, p.p440-43.

Wood D. and Beck R. (1989), Janine Eber maps London: individual dimensions of cognitive imagery, Journal of environmental psychology, Vol.9, p.p.1-26.

Yarbus, L. (1967), Eye Movements and Vision. Plenum. New York.

Yin, R. (1994), Case study research: design and methods, Sage Publications.

BIBLIOGRAPHY

Age Concern (2005), Buying retirement housing-Factsheet 2, London, Age concern.

Alexander C., Ishikawa S., Silverstein, Jacobson M., King I. And Angel S. (1977), A pattern language, town, building, construction, New York, Oxford University Press.

Backman L., Small B. and Wahlin A. (2001), Aging and memory, In Birren J and Schaie K (ED.) Handbook of the psychology of aging, Academic Press, London, pp.349-377.

Bartlett F. (1932), Remembering, Cambridge, Cambridge University press.

Bayes, K. (1967), The therapeutic effect of environment on emotionally disturbed and mentally subnormal children, London, The Gresham Press.

Brech J. and Potter P (1994), Grawing older in the community: European projects in housing and planning, Frankfurt, Anchor Housing Trust.

Office of National Statistic (2002), Population: from age 22 women out number men, [WWW] Avalable from: http://www.statistics.gov.uk/cci/nugget.asp?id=431 [Accessed on 14/2/04].

Parry I. and Tompson L. (1995), Effective sheltered housing, A hand book, Glasgow, Longman Group.

Schaie, W. (1996), Intellectual development in adulthood: the Seattle longitudinal study. New York: Cambridge university press.

Smith A. (1980), Age differences in encoding, storage, and retrieval, in Poon L, Forzard J, Cermak L, Arenberg D and Thompson L, Ed, New directions in memory and aging, New Jersey, Lawrence Erlbaum Associates.

Sumner K. (2002), Our home, our lives, choice in later life living arrangements, London, Centre for Policy On Aging.

The British psychological society (2008), Ethical principles for conducting research with human participants, [WWW] Avalable from: http://www.bps.org.uk, [Accessed on 14/6/08].

APPENDICES

APPENDIX. Ⅲ-Ⅰ. Questionnaire for Detail Recall survey.

Questions for Detail Recall Survey:

Entrance area

- ☐ Colour of paint on the wall
- ☐ Decoration in the area (please list 2 items)
- ☐ Type of lighting used in the entrance area
- ☐ Type of entrance door
- ☐ Type of flooring

Common room /lounge

- ☐ Colour of paint on the wall
- ☐ Decoration in the area (please list 2 items)
- ☐ Type of lighting used in the common room
- ☐ Type of chairs/sofas used in the common room
- ☐ Type of flooring

Common room Kitchen

- ☐ Colour of paint on the wall
- ☐ Type of curtain used in the common room kitchen or any other decoration
- ☐ Type of lighting used in the common room kitchen
- ☐ Furniture or Equipment in the kitchen (please list 3 items)
- ☐ Type of flooring

Laundry

- ☐ Colour of paint on the wall
- ☐ Type of curtain used in the laundry or any other decoration
- ☐ Type of lighting used in the laundry
- ☐ Furniture or Equipment in the laundry (please list 3 items)
- ☐ Type of flooring

Common Shower room

- ☐ Colour of paint on the wall
- ☐ Pattern of tile on the wall
- ☐ Type of lighting used in the shower room
- ☐ Furniture or Equipment in the shower room (please list 2 items)
- ☐ Type of flooring

APPENDIX. Ⅲ-Ⅱ. Protocol of coding participants' verbal information (User-centred

PROTOCOL OF CODING PARTICIPANTS' VERBAL INFORMATION	
Categories of Interior Elements:	**Any issues mentioned by subjects related to / or condition/situation caused by:**
A. Room size	**Size/dimension of individual area**
B. Layout of space	➢ **Layout of space (plan of space)** ➢ **Shape of space** ➢ **Position of door/ window** ➢ **Location of individual space/area** ➢ **Location of stairs** ➢ **Layer of the building (Level of floor)**
C. Colour	➢ **Colour scheme of individual space**
D. Decoration (other than paint)	➢ **Decoration of individual area.** **For example: flowers, plants, pictures or paintings (drawing) hanging on the wall etc.** ➢ **Wallpaper** ➢ **Pattern** ➢ **Window blind / curtain**
E. Lighting	➢ **Lighting system of individual space** ➢ **Including artificial light and natural light**
F. Furniture/equipment	**Furniture:** ➢ **Chair, Sofa, Table, desk, wardrobe, cabinet etc.** ➢ **Door / window** **Equipment:** ➢ **Hand Rail** ➢ **Spy-hole on the door** ➢ **Number plate on the door** ➢ **Stair lift** ➢ **Security locks** ➢ **Notice board** ➢ **Rubbish chute**
G. Space arrangement	➢ **Furniture/equipment arrangement in individual space/area**
H. Flooring	➢ **Floor material/colour**

APPENDIX. Ⅲ-Ⅲ. Design checklist from User-centred Conversational Tour.

Design issues identified by elderly subjects

Area	Design issues identified by elderly subjects from real site record survey
Building Entrance area	
Design issue identified	➢ Entrance area should be adequately sized, and the main door should be recognizable, making it easier for the elderly residents to identify. ➢ Light bright paintwork on the wall together with natural light can make the entrance area more spacious, especially when decorated with pictures and flowers. ➢ The UPVC door makes the space feel more secure and clean to the subjects. ➢ The colour of the carpet and curtain should match the colour of the wall in order to make the space complete. ➢ Lighting is essential for the entrance area. ➢ Decoration can make the entrance area more attractive. ➢ An entrance area with a few seats and a view of the garden would present people with a more welcome feeling and would function as an area to sit while they were waiting. ➢ Carpet in the entrance area should, preferably, be in a dark colour as people walk directly over it from the outside.

Common room	
Design issues identified	➢ Decorating with pictures and real flowers can make the common room more attractive. ➢ Colour of the pictures used to decorate the space can affect residents' emotion. ➢ Upholstery of the chairs may affect their usage. ➢ Simple designed wallpaper or light paintwork are best choice for the common room. ➢ Location of the heating i.e. radiators is extremely important as this may cause danger to the elderly residents. ➢ The size of the common room and the amount of furniture should be adequate for the number of residents. Size will determine how the space is arranged. ➢ Chairs situated along the perimeter of the room make the area feel more spacious. ➢ A window view from the seating area is important; especially as windows can bring in daylight to make the space brighter and pleasant. ➢ The colour of the curtains should match the colour of the wall to make the space complete. ➢ Colour of the carpet should consider the function of the space. ➢ Building layout and the location of the common room is extremely important, as this will affect the use of natural light. ➢ A good lighting scheme including artificial and natural light is essential for the elderly residents. ➢ Facilities such as magnifiers will enhance residents' use of the common room, particularly those with sight impairment.

Common kitchen	
Design issues identified	➢ Size is an important issue for the common room kitchen and the design should consider the activities for 2-3 people working at the same time. ➢ A sliding door could save some space in the kitchen ➢ Bright paintwork and good furniture/equipment can create a friendly environment. ➢ A hatch between kitchen and common room is convenient for the elderly residents. ➢ Where kitchen windows face public areas, a blind may be desirable.
Laundry	
Design issues identified	➢ Having 2 laundries on different levels would be helpful for people with mobility difficulties ➢ The size of the drip dry area should consider the number of the residents in the building ➢ Bright paintwork and good lighting make for a pleasant environment as it makes the space feel brighter and spacious. ➢ Equipment and furniture are important issues in laundry as it is a functional space for the resident. ➢ Partition between the washing machine and drier is not necessary. ➢ Size is not an important issue for the laundry, as long as it provides enough space for the activities. ➢ A message board in this common space can encourage communication between residents.

Common shower	
Design issue identified	➢ Size of the shower room should be enough for its function and should accommodate wheelchair users. ➢ Seated shower and other assisted facilities are essential to the elderly residents. ➢ Lighting is extremely important in shower room as it is related to health and safety issues. ➢ Disabled toilet and shower room can be modified as one unit to make maximum use of the space, particularly as few residents actually use the common shower room. ➢ The pattern of the tiles on the wall should be kept simple but not bland.

➢ **Other Spatial Areas**	
Corridor	
Design issue identified	➢ With the corridor leading to the public space would be better if have frosted glass or blind, because the privacy reason ➢ There needs to be enough space outside of the lift for scooters to turn and go into the storeroom or individual flat. ➢ Use of different colours to define floor levels makes them easily identifiable to the elderly residents. ➢ The positioning of windows along the corridor can make use of the natural light and provide information from the outside world. ➢ Proper use of a wider corridor can create homey feeling about the space e.g. table with seat and view of garden etc. ➢ Corridors with windows make the area look spacious. ➢ Concealed lighting used in the corridor is very effective. ➢ Non-slip flooring in front of the lift and entrance can prevent accidents. ➢ Bright paintwork in the corridor can make the space feel wider, brighter and cleaner. ➢ Corridors with straight lines will benefit the elderly residents, especially wheelchair and scooter users.

Design issue identified	➢ Corridors decorated with pictures (especially personal pictures or drawings) and plants, can make the space feel homely and cozy. ➢ Providing some seating areas on upper floors with the view of garden can help residents who unable to travel to the downstairs lounge. ➢ The hand rail in the corridor is very useful for the elderly residents.
Staircase area.	
Design issue identified	➢ Plastic tiles on the stairs are easy to maintain. ➢ Bright coloured paintwork on the wall and a good lighting scheme can help the elderly to see clearly. ➢ A well-lit staircase is essential as it relates to health and safety for the elderly resident ➢ Staircase with open window can bring in more natural light and view of the outside environment

Other	
Design issue identified	➢ Building layout should take into consideration the elderly resident's abilities by avoiding too many levels. This is important as it will determine the way finding for the residents. ➢ Corridor with simple layout is important in sheltered housing design especially with large scale building ➢ Size of the car park should be adequate for the number of residents in the building. **Flat Door** ➢ Spy hole in the flat door can make the elderly resident feel more secure ➢ Large form of door numbering can help the resident to identify **Refuse area** ➢ The refuse area should be located at ground floor level and a convenient linked shoot should be provided for the upper levels.

Conversational Tour).

APPENDIX. Ⅳ-Ⅰ. Research project information statement.

RESEARCH PROJECT INFORMATION STATEMENT

Title of Project:

An investigation into the use of a multi-methodological approach to improve the effectiveness of data gathered from elderly respondents, in relation to the interior environmental features of sheltered housing schemes.

What is an Information Statement?

These pages contain information about a research project we are inviting you to take part in. The purpose of this information is to explain to you clearly and openly all the steps and procedures of this project.

What is the Research Project about?

The research is carried out by De Montfort University and associated with Leicester City Council Housing Department, investigating elderly persons' perceptions of the interior environments of sheltered housing.

In the study, the aim is to determine the priority of selected interior design elements and spatial areas by the elderly and their perceptions toward sheltered housing design. Moreover, it seeks to understand how the elderly observe/inspect space and their preferences concerning the space.

The results could be, firstly, used to prioritise and improve current and future design. Secondly, these could be used to establish budget priorities relative to the building of

new sheltered accommodation. This will help to assist design practices to improve the design of residential environments for the elderly and, moreover, enable these environments to contribute to their everyday lives in a more positive way.

Who is the Researcher?

Mr. David Lee, who is a PhD Researcher at De Montfort University.

Why are you being asked to be in this research project?

We need to know how elderly observe/inspect space and what they think about their residential environment and that is how you can help. The research process will take around 6 hours of your time altogether, which will be divided into 2 to 3 days. First we will take you to visit another sheltered housing scheme and ask you to walk around the space with a spy camera we give to you, followed by an interview. Next, we will ask you to record your own sheltered housing and tell us your feelings about the recent space design followed by an interview. Then, we will analyse the results and finally interview you again to evaluate the results.

The information that you give us will help us to understand the advantages and disadvantages of recent design so this can then be used to help design practices and improve the design of residential environments for the elderly.

How will your information be used?

All information collected by communication and human participation would be conducted in a professional manner with care and respect afforded to all individuals concerned.

As you might query the ethical issues, the Faculty Research Ethics Committee at De

Montfort University has approved this study and participants' identities in this research will be kept confidential by the researcher and during the transcription. Participants' names will be replaced with code numbers. Thus, the results of the study, published or unpublished, will in no way identify a participant.

Moreover, during the research the personal data (such as your address), tape/photographs/video recordings and transcripts will be stored in a locked desk in the researcher's office. Any information that we keep on a computer will be protected with a password. Other than the researcher, only the supervisors will have access to the raw data.

The information will be kept for 7 years and will then be destroyed (deleted or shredded). If we talk or write about the results we will not use your names and we will refer only to the results of the whole group, not individual people.

Will you be informed of the results when the research project is finished?

Yes. When the project (pilot study) is finished, we will send you out a summary of what we found. However, please note that the pilot study may not be finished for another 5 months and the whole project will take another 1 year to finish.

If you would like more information about the study or if you have any concerns about the study, please contact

David Lee

Pelham Way, Leicester, LE1 5UD

Email: MLEE@dmu.ac.uk

APPENDIX. Ⅳ-Ⅱ. Interview questionnaire - personal details & background from elderly participants.

Date/Time of visit:

Section A. Personal details:

- □ Name:
- □ Preferred name on the report: (your name will be replaced with code numbers. Thus, the results of the study, published or unpublished, will in no way identify a participant.)
- □ Gender:
- □ Age:
- □ Marital status (are you married):
- □ Ethnicity:
- □ Occupation (what is/was your own main occupation?) (now or before retired):

Section B. About accommodations:

1. **How long have you been living here?**
2. **Before you came to live here, where were you living and for how long?**

- □ Property type?
- □ Can you briefly describe it?
- □ How many rooms?
- □ Did you live with other relatives or friends?

3. **What was your main reason for choosing this particular scheme (Building)?**

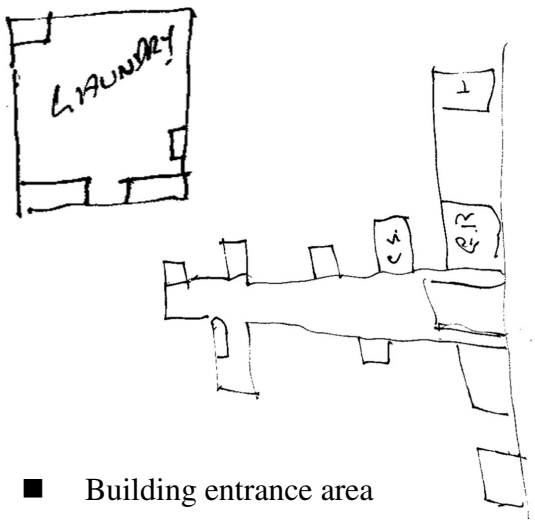
APPENDIX. Ⅳ-Ⅲ. Sketch Map drawings from individual participants.

Sketch Map drawings by Alan

*Drawing 1 (Participant's own scheme): Bob Trewick House

■ Common room and common kitchen

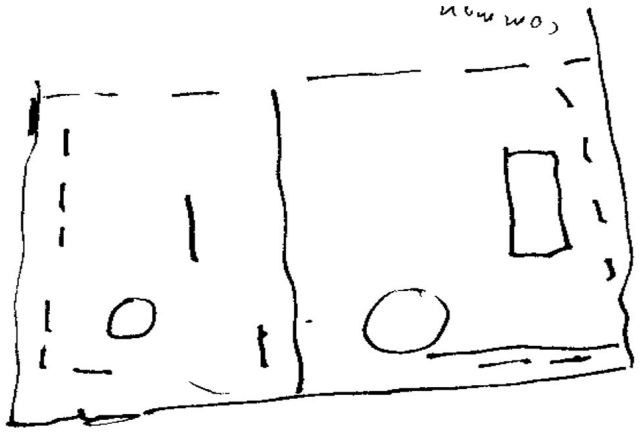
■ Laundry



■ Building entrance area

*Drawing 2 (visited scheme): Frederick Jackson House

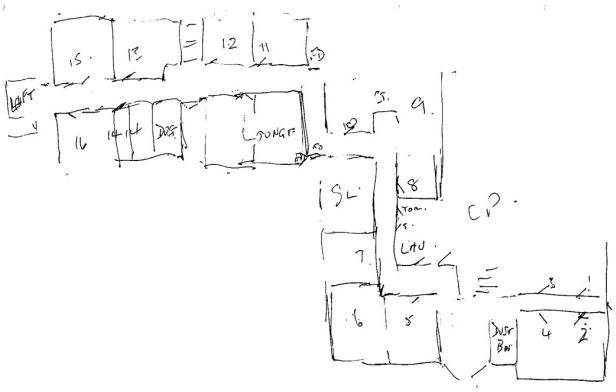
■ Laundry



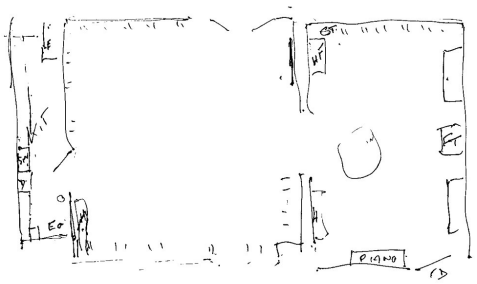
■ Common room

Sketch Map drawings by James

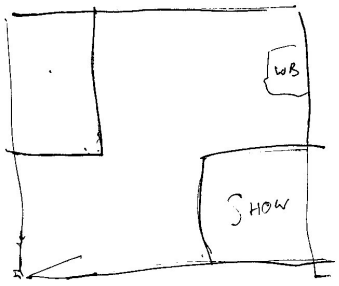
*Drawing 1 (Participant's own scheme): Rupert House



■ Building entrance area

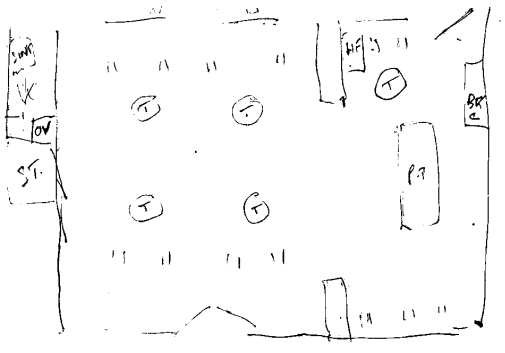


■ Common room and common kitchen

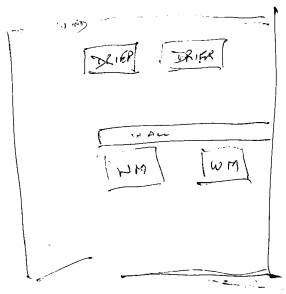


■ Shower room

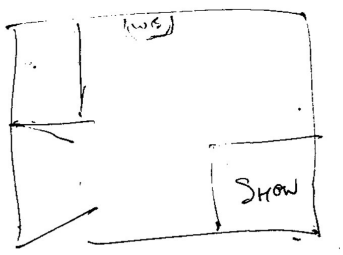
*Drawing 2 (visited scheme): Frederick Jackson House



■ Common room and common kitchen



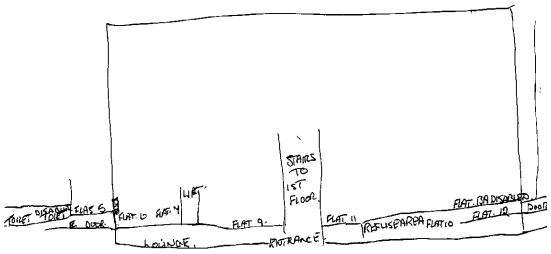
■ Laundry



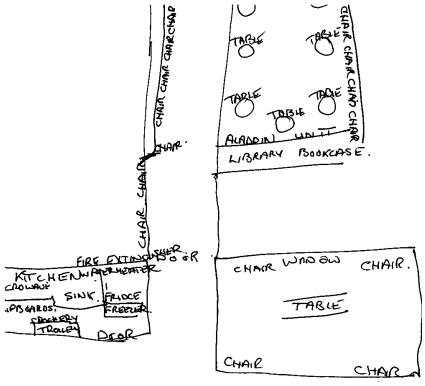
■ Shower room

Sketch Map drawings by Joyce

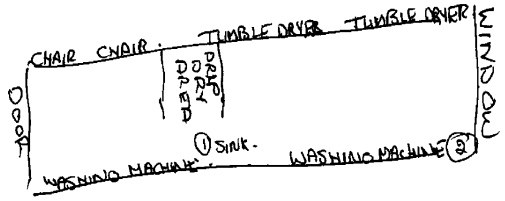
*Drawing 1 (Participant's own scheme): Norfolk House



■ Building entrance area

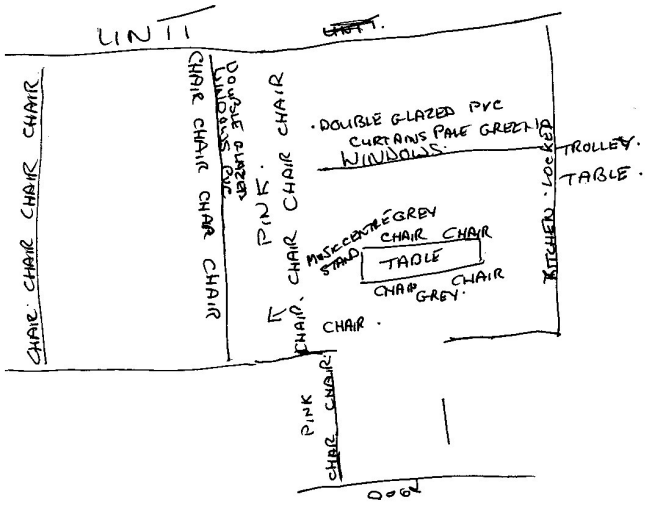


■ Common room and common kitchen

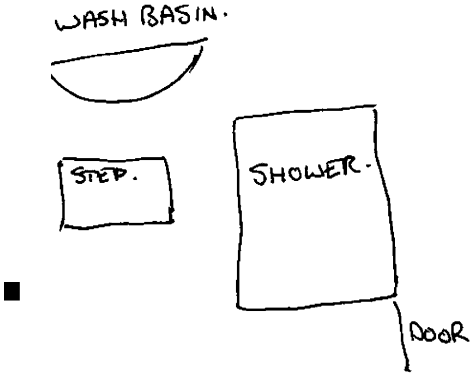


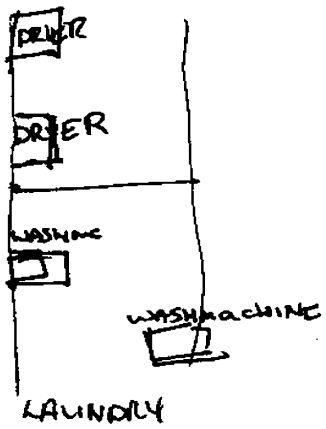
■ Laundry

*Drawing 2 (Visited scheme): John Minto House



■ Common room

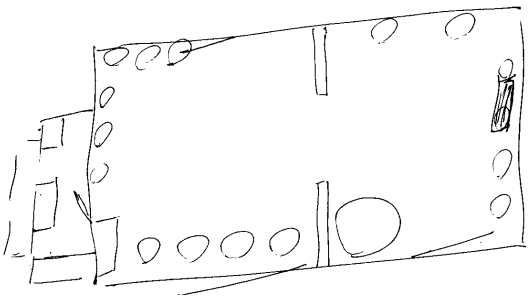




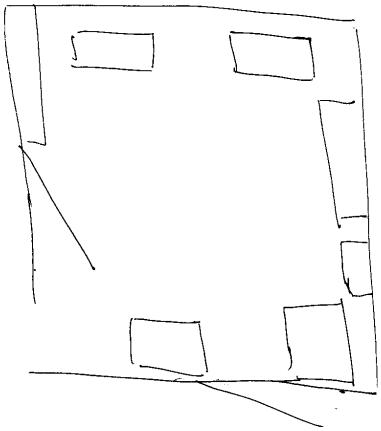
■ Laundry

Sketch Map drawings by Norma

*Drawing 1 (Participant's own scheme): Rupert House

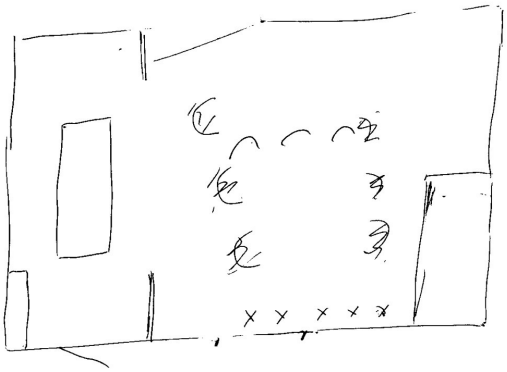


■ Common room and common kitchen

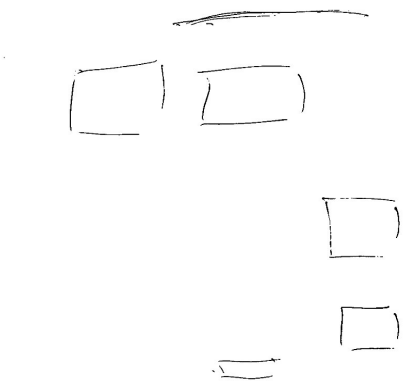


■ Laundry

*Drawing 2 (visited scheme): Frederick Jackson House



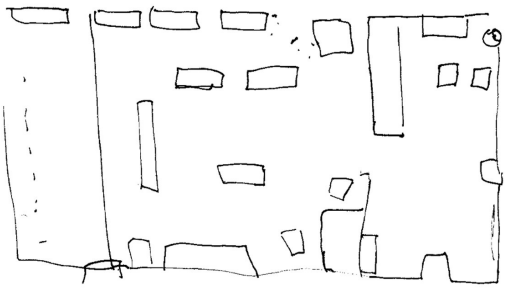
■ Common room and common kitchen



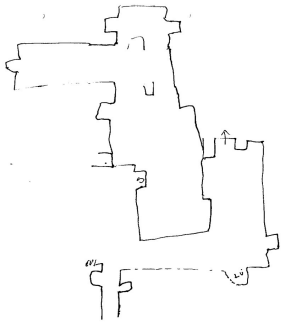
■ Laundry

Sketch Map drawings by Patricia

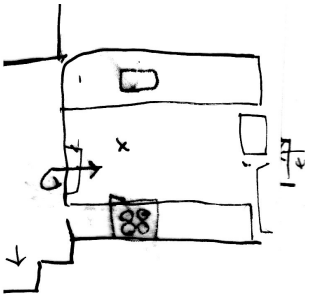
*Drawing 1 (Participant's own scheme): Bob Trewick House



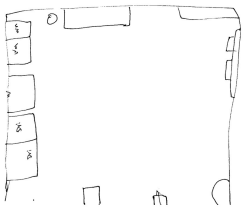
■ Common room



■ Building entrance area

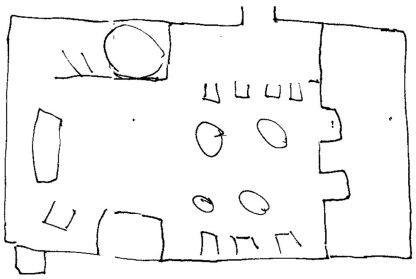


■ Common kitchen

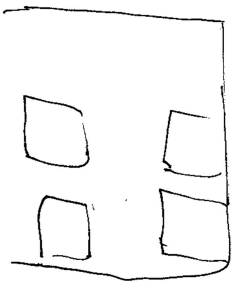


■ Laundry

*Drawing 2 (visited scheme): Frederick Jackson House



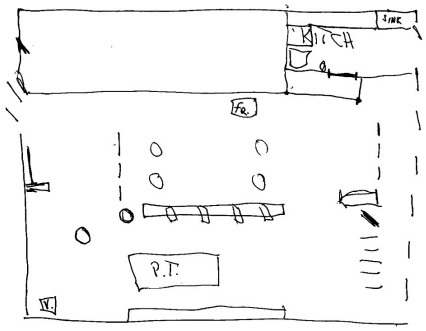
■ Common room and common kitchen

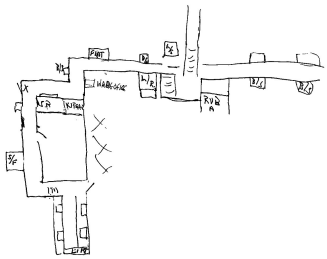


■ Laundry

Sketch Map drawings by Pops

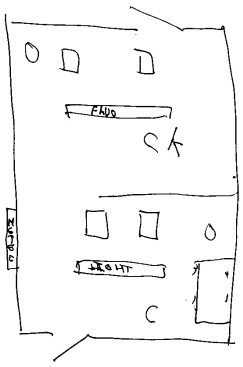
*Drawing 1 (Participant's own scheme): Frederick Jackson House



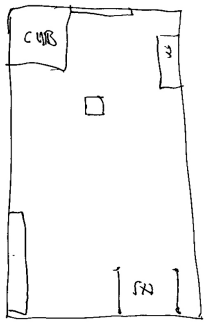


■ Building entrance area

■ Common room and common kitchen

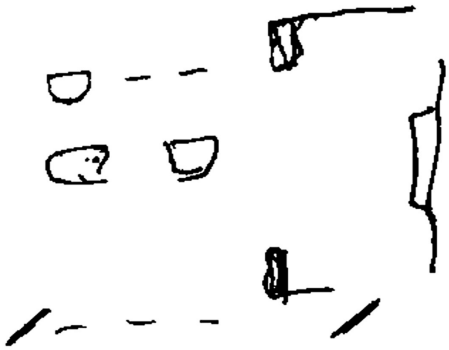


■ Laundry

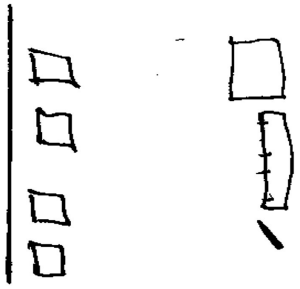


■ Shower room

*Drawing 2 (visited scheme): Bob Trewick House



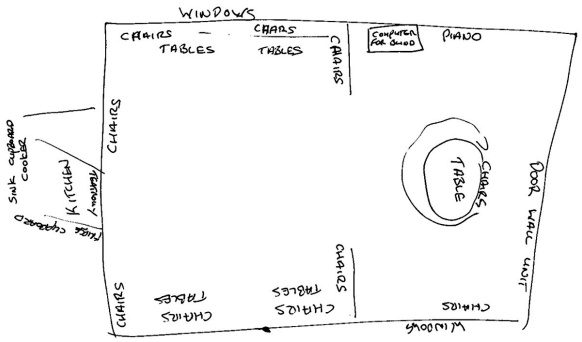
■ Common room and common kitchen



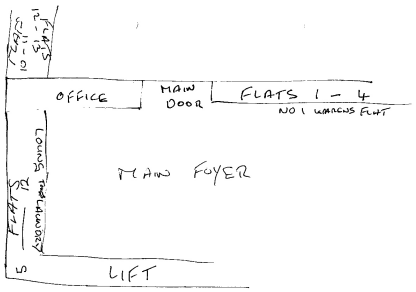
■ Laundry

Sketch Map drawings by Sue

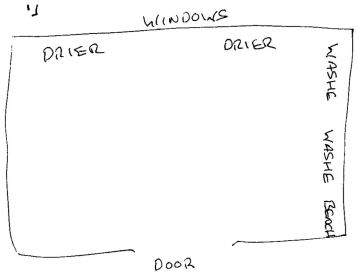
*Drawing 1 (Participant's own scheme): Cromwell House



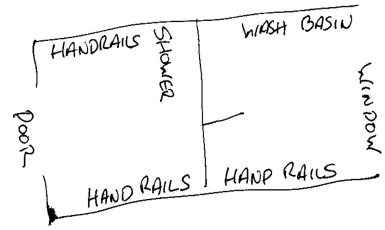
■ Common room and common kitchen



■ Building entrance area

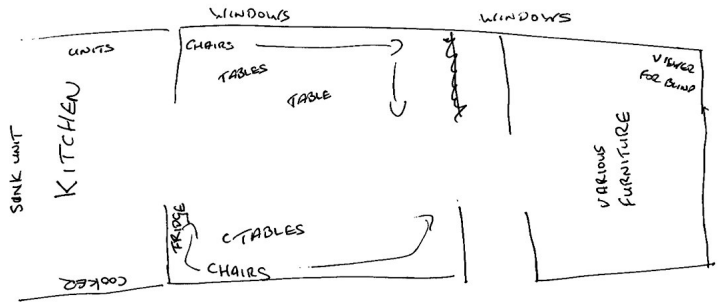


■ Shower room

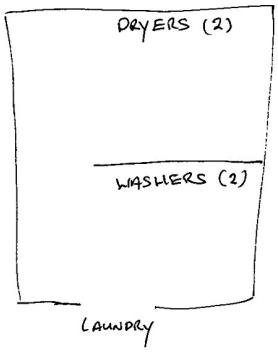


■ Laundry

*Drawing 2 (visited scheme): Frederick Jackson House



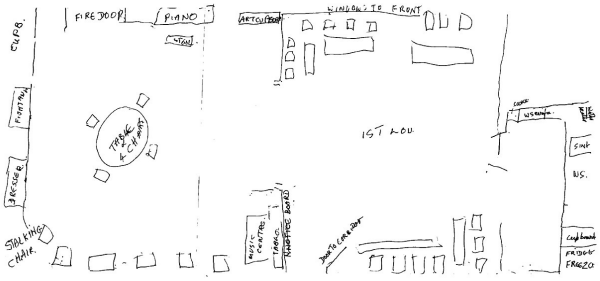
■ Common room and common kitchen



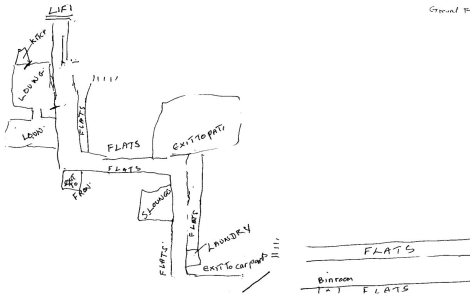
■ Laundry

Sketch Map drawings by Yvonne

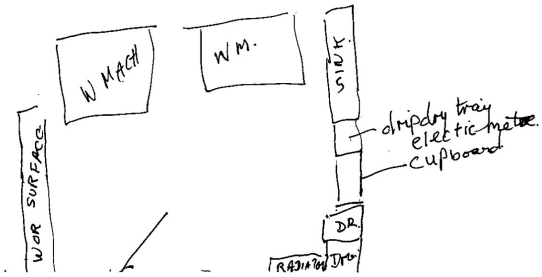
*Drawing 1 (Participant's own scheme): Rupert House



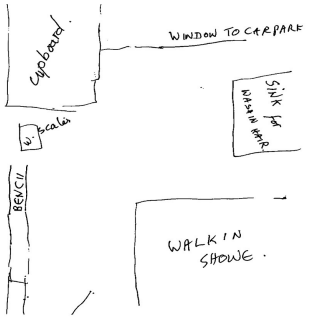
■ Common room and common kitchen



■ Building entrance area

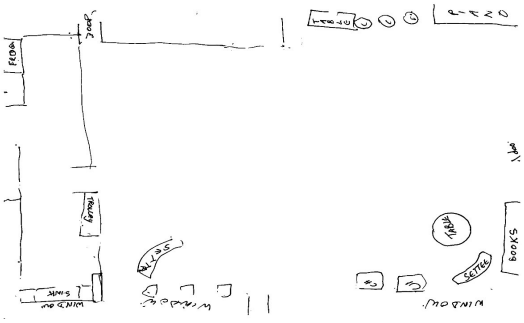


■ Laundry

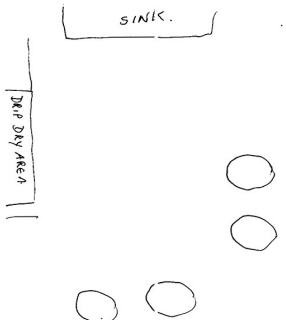


■ Shower room

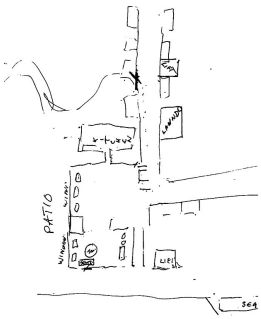
*Drawing 2 (visited scheme): Cromwell House



■ Common room and common kitchen



■ Laundry



■ Building entrance area

APPENDIX Ⅳ-Ⅳ. Result from Detail Recall Survey

	Alan		Patric		Sue		Joyce		Pops		Yvon		Jame		Norm		Average score subject got in each area
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	
Entrance area																	
C Colour of the paint on the wall	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	0	
D decoration in the area (list 2)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
E Type of the lighting using in the entrance area	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	
F Type of the entrance door	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	
H type of flooring	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	4.19
Common room /lounge																	
C Colour of the paint on the wall	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	
D decoration in the area (list 2)	0	0	0	1	1	1	0	1	0	0	1	1	1	0	1	0	
E Type of the lighting using in the common room	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	0	
F Type of the Chair/sofa in the common room	1	0	1	0	1	1	1	0	1	1	1	0	1	1	1	0	
H type of flooring	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	3.5
Common room Kitchen																	
C Colour of the paint on the wall	1	0	1	1	1	0	1	0	1	0	1	0	1	1	1	0	
D type of curtain using in the common room kitchen	1	0	1	0	1	0	0	0	1	1	1	1	1	0	1	0	
E Type of the lighting using in the common room	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	1	
F Equipment in the kitchen	1	0	0	0	1	1	0	0	1	0	1	0	1	1	0	0	
H type of flooring	1	1	1	1	1	0	1	0	1	0	1	0	1	0	0	0	2.81
Laundry																	
C Colour of the paint on the wall	0	1	1	0	1	0	1	0	1	0	1	1	1	1	1	1	
D type of curtain using in the laundry	1	0	1	1	1	0	1	0	1	1	1	0	1	0	0	0	
E Type of the lighting using in the laundry	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1	0	
F Equipment in the laundry	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	
H type of flooring	0	0	1	0	1	0	1	0	1	0	0	0	0	0	1	0	3
Common Showroom																	
C Colour of the paint using on common room shower	1	0	1	0	1	1	1	1	1	0	1	1	1	0	1	0	
D pattern of the tile on the wall	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	
E Type of the lighting using in the common shower room	0	0	1	0	1	1	1	0	1	1	1	0	1	0	0	0	
F Equipment in the shower room	0	0	0	0	1	0	1	1	1	0	1	0	1	1	0	0	
H type of flooring	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	2.31

M1 : Detail Recall of subjects' own scheme

M2: Detail Recall of visited scheme

1: Participant got the correct answer

0: participant didn't got correct answer

APPENDIX Ⅳ-Ⅴ. Result from User-centred Conversational Tour: perceptions of each selected spatial area.

Area	Subjects' Preferences of the Space and Perceptions of space design Issues identified from real site record survey
Building Entrance area	
■ **Negative information**	Subjects state that: ➢ The entrance area is too small. ➢ Some extra lighting would make the space brighter. ➢ They prefer bright colours in the entrance area ➢ They cannot identify the main door and were confused with other exit doors. (The design of the main entrance should make it easier for the elderly people to identify) ➢ A UPVC door would make the space more secure and looks clean ➢ Decoration can make the entrance area more attractive. ➢ It would be preferable for the colour of the carpet to match the colour of the wall. ➢ Having more seats near the entrance would be good for residents to sit on while waiting. ➢ The colour and look of the carpet is uninteresting.

■ **Positive information**	Subjects state that: ➢ Bright coloured walls and natural light can make the area more spacious, especially when fitted with suitable curtains. ➢ An entrance area with a few seats and view of the garden would give people a more welcome feeling ➢ Entrance area should be decorated with pictures and flowers. ➢ The UPVC door is preferable to an ordinary door ➢ Using a dark coloured carpet would be a better option as people walk over it directly from the outside environment.

Common room	
■ Negative information	Subjects state that: ➢ They prefer real flowers instead of plastic ones. ➢ They prefer bright coloured pictures for decoration. ➢ They do not like armchairs with plastic upholstery ➢ Natural light through windows make the space more bright during the day ➢ Complex wallpaper make the subject feel nauseous ➢ Some of the furniture needs to be renewed ➢ The carpet in the common room needs to be renewed ➢ The size of the common room is too small in relation to the number of residents, and this limits the options for space arrangement. ➢ Location of the heating i.e. Radiators is extremely important because this may cause danger to the elderly residents. ➢ Amount of furniture in the common room should depend on the number of the tenants.

■ **Positive information**	Subjects state that: ➢ This area is spacious and has enough seating, considering the number of people using the space. ➢ Chairs situated along the perimeter of the room make the area feel more spacious. ➢ A window view is important for the seating area. ➢ Colour and decoration are essential. ➢ The French window is good to for fresh air and natural lighting. ➢ A few chairs facing the window are a good idea. ➢ They like the use of pictures as decoration on the wall. ➢ The colour of the curtains should match paint on the wall. ➢ It is good to have a nice view outside the common room especially with windows that can bring in daylight and make the space brighter. ➢ They prefer light coloured paint and carpet. ➢ The size of the room is a big issue. ➢ Good use of natural light can make the space brighter and more pleasant. ➢ They prefer dark coloured carpets because they are less likely to show dirt. ➢ A good lighting scheme including artificial and natural light is essential. ➢ They are satisfied with the current layout and size of the lounge (seats along the wall) ➢ Facilities such as magnifiers can aid residents with sight impairment. ➢ A small sized lounge is better for talking to each other

Common kitchen	
■ **Negative information**	Subjects state that: ➢ Size is an important issue for the common room kitchen; the design should consider the activities in the kitchen for 2-3 people at the same time. ➢ The kitchen is too small for people to move around when holding a party. ➢ A sliding door could save some space in the kitchen.
■ **Positive information**	Subjects state that: ➢ The size of the kitchen catches their attention ➢ The space is friendly because of the colour and furniture/equipment) (Colour and good furniture/equipment can affect how subject feels about the space. ➢ The colour used on the wall brightens up the space. (light purple) ➢ A hatch between kitchen and common room is convenient. ➢ The common room kitchen should accommodate 2-3 people. ➢ The kitchen is well laid out. ➢ Having blinds in the kitchen is pleasing

Laundry	
■ **Negative information**	Subjects state that: ➢ The size of the laundry catches their attention ➢ Having 2 laundries on different levels would be helpful for people with mobility difficulties. ➢ They prefer bright and light coloured paint on the wall and pipes ➢ Colour can affect their emotions. ➢ They prefer light green rather than sunshine yellow. ➢ The size of the drip dry area should consider the number of the residents in the building. ➢ They did not like the colour on the wall.

■ **Positive information**	Subjects state that: ➢ The colour makes the space feel brighter. ➢ The area is clean and spacious. ➢ The bright paintwork and good light is pleasant. ➢ Equipment and furniture are an important issue in the laundry. ➢ Size of the room is an important issue. ➢ Size of the laundry should provide just enough room for the activities. ➢ They prefer bright coloured paint on the wall. ➢ They are satisfied with the layout of laundry. (in 1 large room and all facilities along the wall) ➢ Size is not an important issue for the laundry, as long as there is enough space for doing the job ➢ A notice board in this space can encourage communication between residents ➢ The laundry is well lit.

Common shower	
■ **Negative information**	Subjects state that: ➢ The shower room is too big. (Size of the room should consider its function). ➢ They prefer common shower room with seated shower and plenty of lighting. ➢ The disabled toilet and shower room can be modified as one unit for maximum use of the space. ➢ The pattern of the tile on the wall should kept simple but not bland.
■ **Positive information**	Subjects state that: ➢ The size of the shower room is good. (Enough for its function) ➢ The size of the shower room should accommodate people using wheelchairs. ➢ Facilities and equipment are a big issue with the shower room ➢ The seated shower is good for elderly people. ➢ The shower room is well lit.

Other issues	
Corridor	
■ **Negative information**	Subjects state that: ➢ They prefer corridors painted with bright colours, which will make the space wider, brighter and cleaner. ➢ A regular (standard) wide corridor with straight lines will benefit the elderly especially the users of wheelchairs or scooters. ➢ They prefer the corridor being decorated with pictures and plants (flowers). ➢ If the corridor leads to a public space it would be better with frosted glass or blinds and would, therefore, be more private. ➢ Personal pictures or drawings hanging along the corridor can make the space homely and cozy. ➢ Providing some seating areas on upper floors can help someone who is unable to travel to downstairs lounge ➢ **The size of the corridor should take into consideration that some residents are using 3 wheel push sticks and wheelchairs.**

■ **Positive information**	Subjects state that: ➢ There needs to be enough space outside of the lift for scooters to turn and go into the storeroom or individual flat. ➢ Yellow lighting makes space feel warmer. ➢ The use of colour to define different floor levels is very helpful. ➢ A window link to the outside world is essential. ➢ They prefer the corridor being decorated with pictures and plants (flowers). ➢ They prefer wider corridors. ➢ They prefer dark coloured carpets. ➢ Using light bright paint on the wall and good lighting can give people a feeling of spaciousness. ➢ Proper use of a wider corridor can create homely feeling about the space e.g. table with seat and view of garden etc. (Good building layout includes: taking advantage of natural lighting and building environment through the positioning of windows). ➢ Corridors with windows make the area look spacious. ➢ Concealed lighting used in the corridor is very effective. ➢ The flooring is fine and that non-slip flooring in front of lift and entrance is a good choice. ➢ It is nice to have seating area arranged along the corridor with a view of the garden. ➢ The hand rail in the corridor is very useful to the elderly residents. ➢ The hand rail in the corridor is very useful to the elderly residents.

Staircase area	
■ **Negative information**	Subject states that: ➢ The staircase area is a little dark because there are no windows (natural light). ➢ The flooring needs to be redecorated as it looks dirty when compared with the new paint on the wall.
■ **Positive information**	Subjects state that: ➢ Plastic tiles on the stairs are easy to maintain. ➢ With bright coloured paint on the wall and a good lighting scheme, this can help the elderly residents to see more clearly. ➢ They prefer carpets with bright colours. ➢ They are satisfied with the current staircase area as it is well lit. ➢ The staircase is well lit and very spacious. ➢ The staircase is nicely built and quite spacious. ➢ A bright open window near the staircase with the natural light and view is pleasant.

Other issues	
■ **Negative information**	Subjects state that: ➢ Building layout should take into consideration elderly people's ability and avoid too many levels. ➢ The building plan shouldn't be complicated as this will affect the way finding for the elderly residents. ➢ Too many levels will affect elderly people's mobility.

APPENDIX. Ⅴ-Ⅰ. Questionnaire for determine the priority of selected design elements and spatial areas for the elderly.

Part 1.

There are **8** design elements listed below with their definition (from A to H). Could you please read them through and answer the questions below (1 to 8)

A. **Room size** (Size/dimension of individual area)
B. **Layout of space** (Shape of space, Position of door, Position of window, Location of individual space/area, Location of stairs, Level of floor)
C. **Colour** (colour scheme (painting) of individual space)
D. Decoration (Decoration of individual area, wallpaper)
E. Lighting (Lighting system of individual space)
F. Furniture/equipment (including all fixed and moveable furniture)
G. **Space arrangement** (Furniture/equipment arrangement in individual space/area)
H. Flooring (Floor material, colour texture etc)

Please select one of the "design elements" above (A to H) to answer the question below (without repeating) for example: if you think "Lighting" is most important element to you, please put "E" in the space at the end of question 1.

*"Important" was defined as: **"the spatial area or design element mentioned has big effect or influence on your lives"** (Longman dictionary of contemporary English 1995)

1. Which element above (choose one from A to H) you think is the **Most** important? _____
2. Which element above (choose one from A to H) you think is the **Second** important? _____
3. Which element above (choose one from A to H) you think is the **Third** important? _____
4. Which element above (choose one from A to H) you think is the **Fourth** important? _____
5. Which element above (choose one from A to H) you think is the **Fifth** important? _____
6. Which element above (choose one from A to H) you think is the **Sixth** important? _____
7. Which element above (choose one from A to H) you think is the **Seventh** important?

_____

8. Which element above (choose one from A to H) you think is the **Least** important? _____

Part 2.

There are 5 individual spaces listed below (from I to P), could you please read them through and answer the question below (1 to 8)

I. Building Entrance area
J. Common room (Lounge)
K. Common kitchen
L. Laundry
M. Common shower room

Please select one of the "Individual spaces" <u>above</u> (I to m) to answer the question below (without repeating) for example: if you think "Common room" is most important space to you, please put "M" in the space at the end of question 1.

1. Which "individual space" above (choose one from I to M) you think is the Most important? _____
2. Which "individual space" above (choose one from I to M) you think is the Second important? _____
3. Which "individual space" above (choose one from I to M) you think is the Third important? _____
4. Which "individual space" above (choose one from I to M) you think is the Fourth important? _____
5. Which "individual space" above (choose one from I to M) you think is the Fifth important? _____

APPENDIX. Ⅴ-Ⅱ. Standard operation procedure (S.O.P) for interview with professionals.

Check Point

First I would like to explain the aim of this interview:
As the results from my primary study have concluded, the aim of the interview survey is to get opinions from professionals like you, to evaluate the research findings and methodologies used.

There are 4 sections in this interview.
First, could you please fill the details of your work experience in section A for me please.

SECTION A. PERSONAL DETAIL

☐ Can you please briefly describe your work experience (history), including: year, employer, position and field of work:

Year	Employer	Position	Field of work
a.			
b.			
c.			
d.			

☐ Please describe your current job responsibility:

Year	Employer	Position	Field of work

SECTION B. OPINION ON RESEARCH METHODS USED

In section B, I am going to introduce my research project and methods used and then ask your opinions.

- First, I am going to briefly introduce the sheltered housing scheme in the UK. Sheltered housing is a group of unfurnished self-contained flats specially designed for the elderly and mainly provided by local authorities. The aim being to enable elderly people to live independently.

  Each flat has one bedroom, a living room, a kitchen and bathroom. And there is also a laundry and a communal lounge where residents can meet and chat. Moreover, each flat has an alarm system linked to a control centre for use in emergency.

  However, as financial constraints are often a major issue with local authorities, the resources must be used as effectively as possible. Therefore, in order to help with financial planning and provide more satisfactory environments, the research aims were to apply multi research methods to determine the priority of interior elements and space areas within the sheltered housing schemes for improvement, more importantly to understand elderly people's perceptions towards sheltered housing design.

  Before explaining the methods used in this research, I would like to show you the design elements and spatial areas I chose for comparison:

- **The list (show list of elements to participant) shows the design elements identified and selected in this research for comparison:**

  Q 1. Do you consider the 8 design elements selected for comparison are suitable? Would you add / subtract any elements from the list? and do you have any other comments?

- **The list (show list of spatial areas to participant) shows the 8 communal spatial areas identified and selected in this research for comparison:**

  Q 2. Do you consider the 5 spatial areas selected for comparison are suitable? Would you add / subtract any spatial area from the list? and do you have any other comments?

Q.3.

There are **8** design elements listed below with their definition (from A to H). Could you please read them through and answer the questions below (1 to 8)

I. **Room size** (Size/dimension of individual area)

J. **Layout of space** (Shape of space, Position of door, Position of window, Location of individual space/area, Location of stairs, Level of floor)

K. **Colour** (colour scheme (painting) of individual space)

L. Decoration (Decoration of individual area, wallpaper)

M. Lighting (Lighting system of individual space)

N. Furniture/equipment (including all fixed and moveable furniture)

O. **Space arrangement** (Furniture/equipment arrangement in individual space/area)

P. Flooring (Floor material, colour texture etc)

Please select one of the "design elements" above (A to H) to answer the question below (without repeating) for example: if you think "Lighting" is most important element to you, please put "E" in the space at the end of question 1.

*"Important" was defined as: **"the spatial area or design element mentioned has big effect or influence on elderly people's lives"** (Longman dictionary of contemporary English 1995)

9. Which element above (choose one from A to H) you think is the **Most** important to the elderly people? _____
10. Which element above (choose one from A to H) you think is the **Second** important to the elderly people? _____
11. Which element above (choose one from A to H) you think is the **Third** important to the elderly people? _____
12. Which element above (choose one from A to H) you think is the **Fourth** important to the elderly people? _____
13. Which element above (choose one from A to H) you think is the **Fifth** important to the elderly people? _____
14. Which element above (choose one from A to H) you think is the **Sixth** important to the elderly people? _____
15. Which element above (choose one from A to H) you think is the **Seventh** important the elderly people? _____
16. Which element above (choose one from A to H) you think is the **Least** important to the elderly people? _____

Q.4.

There are 5 individual spaces listed below (from I to P), could you please read them through and answer the question below (1 to 8)

N. Building Entrance area
O. Common room (Lounge)
P. Common kitchen
Q. Laundry
R. Common shower room

Please select one of the "Individual spaces" <u>above</u> (I to m) to answer the question below (without repeating) for example: if you think "Common room" is most important space to you, please put "M" in the space at the end of question 1.

6. Which "individual space" above (choose one from I to m) you think is the Most important to **the elderly people**? _____
7. Which "individual space" above (choose one from I to m) you think is the Second important to **the elderly people**? _____
8. Which "individual space" above (choose one from I to m) you think is the Third important to **the elderly people**? _____
9. Which "individual space" above (choose one from I to m) you think is the Fourth important to **the elderly people**? _____
10. Which "individual space" above (choose one from I to m) you think is the Fifth important to **the elderly people**? _____

About research methodologies:

Most current research studies have used interviews or questionnaires in order to evaluate participants' responses to spatial design solutions. However, most studies do not recognise the fact that the impact of a design is frequently subliminal. Therefore, even with a large number of respondents, it is suggested that results so obtained can prove unreliable. Therefore, 4 different methods were chosen to test in this study:

- **First, the Visual Record Survey (VRS)**

In this survey, subjects were taken to visit another unfamiliar sheltered housing building and asked to wear special wireless visual-witness goggles to record the whole visiting process *(show equipment)*.

Since the camera has no selectivity, it documents exactly what participants see and the time a subject spent in each area. This data was used to establish the perceived relative importance of each of the 5-selected areas as experienced by each subject; based upon the hypothesis that a person will spend more time in an area in which they think is more important to them.

☐ **Q5. About this methodology, in your opinion, are there any advantages and disadvantages? and do you have any other comments?**

- **Second methodology called: Detail Recall survey (DRS)**

This was carried out in order to determine the priority of interior design elements to the elderly, after participants were taken to visit another unfamiliar sheltered housing building. The memory test method was used to test subjects' memory about detailed interior elements in their own and visited scheme, particularly as visual memory is selective and people remember what is useful and important to them.

To achieve this, a questionnaire was designed to test subjects' memory on the details of different design elements within 5 selected spatial areas in their own scheme and visit scheme.

☐ **Q6. About this methodology, in your opinion, are there any advantages and disadvantages? and do you have any other comments?**

- **Third methodology used called: Sketch Map survey (SMS)**

After participants were taken to visit another unfamiliar sheltered housing building, a drawing technique was used to gain understanding about elderly person's perceptions of the building environment as well as the perceived priority of spatial areas within the scheme. This entailed all participants producing a drawing of the space within their own and visited scheme from their memory. Each drawing was analysed with reference to the real site plan to compare the differences and evaluate subjects' memory between different areas.

☐ **Q7. Sketch map Survey: About this methodology, in your opinion, are there any advantages and disadvantages? and do you have any other comments?**

- **Fourth methodology used called User-centred Conversational Tour (UCCT)**

A questionnaire-based survey was often used to find out participants' perception of interior space. However, by answering the question, subjects need to imagine or recall their memories about interior spaces. Therefore, this method might produce unreliable answers. For this reasons, in this study, participants were assigned to each of selected areas and asked to give direct feedback regarding their feelings about the design of individual areas. Visual image and narrative information was recorded by using mini digital camcorders.

☐ **Q8. About this methodology, in your opinion, are there any advantages and disadvantages? and do you have any other comments?**

SECTION C. OPINION ON RESEARCH RESULTS

- To compare the result between **indirect methods** and **questionnaire**, a questionnaire was designed to ask subjects' opinions on priority of design elements and space areas

In this section, I am going to explain the research findings and ask your opinions.

First, results on priority of design elements

- **Result from questionnaire:**

Room size > Layout of space > Space arrangement > Colour scheme > Furniture/equipment > Lighting > Decoration > Flooring

☐ **Q9. Would you expect the results to be as those that were obtained? And could you explain your reasons for this? If the answer is NO, Why?**

- **Results from Detail Recall survey:**

  Colour scheme (72.50%) > Furniture/equipment (67.50%) > Lighting (63.75%) > Decoration (56.25%) > Flooring (52.50%).

☐ **Q10. Would you expect the results to be as those obtained? And could you explain your reasons for this? If the answer is NO, Why?**

Second, results on priority of space areas

- **Result from questionnaire:**
  - Entrance area > Common room > Laundry > Corridor > kitchen > Staircase area > shower room

☐ **Q11. Would you expect the results to be as those obtained? And could you explain your reasons for this? If the answer is NO, Why?**

■ **Result from Visual Record survey:**

Common room>Entrance>Laundry>kitchen>shower

Q12. Would you expect the results to be as those obtained? And could you explain your reasons for this? If the answer is NO, Why?

■ **Result from Sketch Map survey:**

Entrance area (5.69 points) > common room (5.66 points) > laundry (4.47 points) > common kitchen (4.22 points) > common shower room (3.31 points)

Q13. Would you expect the results to be as those obtained? And could you explain your reasons for this? If the answer is NO, Why?

SECTION D. OTHERS

Q.14 What do you think of the overall project and its future practical value. Also what do you think of the methods used?

Q 15. In your experience, how do designers deal with budget limitations in real situations? In particular achieving the balance between design elements and space areas within a building with a given budget?

APPENDIX. V-Ⅲ. Data analysis sheet for interview with professionals

Example from professional's answers	*Q.1*	*Q.2*	*Q.5*	*Q.6*	*Q.7*	*Q.8*	*Q.9*	*Q.10*	*Q.11*	*Q.12*	*Q.13*	*Q.14*
Ann B.		*Only garden.because access to space around is important.	*it will be useful and I think it should work, I think people will pay more attention to the areas that are important to them	*the elderly people are more likely to say what they don't like	*Yes, because it will end up with know what they like & what they don't like	*the methodology provide structure and enable people to start it *elderly people are more likely to say thinks they dislike rather than they like.	*The lighting is the only one surprised me	*I am surprise in colour	*it don't surprise me	*I expect something like that	*I can think of that really	*I think a research this type will possibly have more important design process is in the high level of care particularly dementia care, because if you don't get it right, it will have very big impact on them
Score	**0**	**4**	**4**	**0**	**2**	**2**	**2**	**2**	**2**	**4**	**4**	**0**
Brian R.	*I think it ok, they could be quite a big element isn't it, the building layout compare with the others but it nothing wrong with that.	*reasonable	*I think it could probably work, I guess they will spend longer, this is my opinion in a larger spaces	*I think its quite good and I think its really restrict by the question isn't it, you don't ask the right questions, and you know the answer.	*I can see the theory *slight doubt about their memory *general principle is good way to get them to think about it	*get more good response *Video camera might make them uncomfortable	*furniture & equipment is surprisingly low *colour is surprisingly high	*it is quite similar order isn't it	*it quite similar to my expected	*Yes, I suppose so *seems to have same expected result	*I suppose so *I think is fairly predicable really	*I think it a good idea *get better or full picture *time consuming
	2	**2**	**2**	**0**	**2**	**2**	**-2**	**4**	**2**	**4**	**4**	**2**
Brian W.	*accessibility (disable accessibility) is another important element	*the list is fine	*important to family member *very interesting principal to use, I can image its quite successful *in principle it a good idea.	*I think that fine that is a good idea	*straggle with drawing *to open the communication process a little more	*I think it a good idea *I don't have anything to add	*only surprised by the colour	*it might be down to description issue.	*I expect that	*A little surprise *I would agree with that	*difficult to pass common on that	*some of the methodology are very good *get as many different opinion with different state holders as possible
Score	**2**	**4**	**2**	**4**	**0**	**4**	**2**	**0**	**4**	**2**	**0**	**2**
Chong-Wong H.	*probably cover most *not sure room size is important *colour scheme often included in decoration	*probably it cover every thing, I think it 's ok	*subject's attitude will affect the overall result and compare result between different participants is essential.	*remember something because they been there very often *is difficult to compare what is important to them or what is not important to them base on the memory	*result from different methods should put together *useful information to know	*very effective *video record document probably that is very useful	*No, I expect the result as what I give you earlier	* yes	*No, not at all	*Yes, because they spent more time in common room	*Yes *but I don't know about the entrance area *I think I expect the result	*The methodology is very useful *not only rely on one methods to do your research *compare all the result instead of just do some interview the end user and professionals
Score	**0**	**4**	**2**	**-4**	**2**	**4**	**-4**	**4**	**-4**	**4**	**2**	**4**
Huei-Ju W.	*colour scheme and decoration are very similar	*I think the office should put in list	*the time spent in each space might not directly related to the importance of area * by doing a follow up interview can help to understand why they spent more time in perticular spatial area	*I think that people are more attracted by colour and they can remember it better *if they need this particular element they might pay more attention	*I think the method can catch more direct thinking from them rather than questionnaire	*I think it a good idea because it's interactive *you can get lot of more feedback *questionnaire will narrow their mind and thinking	*No, it different than what I think	*The flooring is a surprise	*I am not surprise	*I am not surprise with the result *I wondering why they spend more time on looking the laundry	*Same, but laundry is still a bit surprise	*your method used can catch peoples first reaction *observed will be more valuable then what they said *the method you used can gathering far more information that paper work or questionnaire
	2	**2**	**0**	**2**	**4**	**4**	**-4**	**2**	**2**	**2**	**2**	**4**

Matthew S.	*I quite follow that you put there already	*Yes, I guess it covers it all	*method used can gethering subconscious answerm subject. *It seems make sense *detail and the size of the areas will affect the time they spend in each area	* The memory recall survey will be more reliable than visual record survey as it has actual feedback from subject. However, the result will depend on people's memory ability.	*the detail of the spatial area could affect the result	*if your research is purely pragmatic to workout what their direct feeling about the space, this probably the best methodology	*Yes, certainly *the size and layout, I would think that would be 3&4	*not surprising *decorating may be more close to the top	*not surprised	*I think this probably not surprise me *I am surprise they spend long time in entrance area	*Yes *you first see the entrance area perhaps that something stay with their memory *shower room & kitchen at the end doesn't surprise me	*good to have that number of different methodologies *it very good to have many data to compare *more practical value to the organization for example *your methodology is very helpful in actually drawing more information and will be more subconscious *that may come down a cost *get more clinical feedback, more scientific almost biotical feedback *the project overall as a very good methodology approach.
Score	**4**	**4**	**2**	**2**	**2**	**4**	**2**	**2**	**2**	**2**	**4**	**4**
Paul M.	*I can't really see different between the colour scheme and decoration *I don't know how you arrange the space without connecting it to layout of space	*I don't know what else they have	*I think that fine, it should be interested to record what they look	*people remember what they like or dislike and forget something they have no opinion on.	*I think that fine as well *you get people to do something and to make them think more.	*I think it better *I would say by taking someone somewhere, you can get more actual result.	*Yes	*I don't really surprise	*I am not surprised with the result	*I put kitchen higher because I assume people spend more time cooking *I totally expected staircase come out last	*The interviewee suprised the entrance area come out higher than common room.	*the methods used are ok if you looking some existing place
Score	**0**	**4**	**4**	**0**	**2**	**2**	**4**	**2**	**2**	**0**	**2**	**2**
Rebecca G.	*I think that 8 is fine.	*I think the old person would like to know where the office is	*I think that a great idea *If you try to find out how people investigate space, I think that a very, very good idea	*people's back ground might affect the result.	*Interviewee think participant would remember the visit scheme better than their own scheme as people might pay more attention to new things and recall their own place for grounded	*I think it good methodology to use	*I would expect the answer slightly different	*Interviewee thinks that people should normally remember flooring better.	*It's just exactly what I expected really	*Yes, I suppose so, that probably absolutely right	*Yes, I suppose so	*I think it going to difficult to quantify how you can use the finding you got and would use it for specific client *I think it is very interesting in term of knowing how elderly person perceive space and pensive their need from sheltered housing, very interesting
	4	**4**	**4**	**2**	**2**	**4**	**2**	**2**	**4**	**4**	**4**	**2**
Stuart W.	*I think the list is fine *Furniture and equipment is two different things	*You just got the list of actual spaces, I mean the only space you haven't got is the individual room	*if you have some thing which is purely function like toilet, then the time and space is only proportion of how long you need for that function *I don't see the connection between time spend & level of importance	*something stood out, or some thing is blond, which one will you remember *what you doing is in principle right *I think the methodology is fine in some ways but you are not using them to work together	*this going to produce most accurate information *it actually about the space and recall from that *the actual quality of information you recorded is a good reliable representation of what people perception is.	*I think that going to be confirming the other research	*That doesn't surprise me at all.	*100%, I can tell you without you doing any research	*Yes.	*That what it would	*Yes, more or less	*The interviewee is happy with the overall project as a methodology approach study. * The interviewee thinks the project is only focused on evaluate existing design of the building and the methods used should take further to evaluate building for the future by evaluating virtual environment.
Score	**2**	**2**	**-4**	**-2**	**4**	**2**	**4**	**4**	**4**	**4**	**4**	**2**
Total score	**16**	**30**	**16**	**4**	**20**	**28**	**6**	**22**	**18**	**26**	**26**	**22**
Average score	**1.78**	**3.33**	**1.78**	**0.44**	**2.22**	**3.11**	**0.67**	**2.44**	**2.00**	**2.89**	**2.89**	**2.44**

Strongly Agree	**4**
Agree	**2**
Neutral	**0**
Disagree	**-2**
Strongly Agree	**-4**

expect the result	**4**
not surprise	**2**
Neutral	**0**
surprise	**-2**
not expect the result	**-4**